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Electrical World

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Electrical World

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Meeting the Crisis

THE nation is now at war. Be it short or long, aggressive or defensive, there can be but one outcome, and that a glorious one. Accustomed to rely on engineers for its upbuilding, the country now looks to them for its defense. As the mouthpiece of the electrical industry the ELECTRICAL WORLD can pledge that in that defense electrical engineers will be foremost in service and in achievement. Mighty as is the force of electricity in construction, it can be made mightier in destruction; and while in a sense it is unfortunate thus to apply science, there is a nobility even in strife and a loftiness of purpose in chastisement. The lesson of more efficient living and production we shall learn, for it is needful for us to apply some quickening leaven to our civic and industrial life to win the race set before us. Our engineers, we are happy to say, have already played an important part in marshaling the manufacturing industries of the country for preparedness and on the Naval Consulting Board. They are now prepared to render greater service, commensurate with the necessities of the occasion and in keeping with American manhood and ideals.

Improving Our Service

EFFECTIVE with the present issue, the ELECTRICAL WORLD will hereafter insert in parentheses after every measurement expressed in English units its metric equivalent. This departure is no novelty so far as regards the literature of American science and engineering. It was first adopted by the American Institute of Electrical Engineers for the text of papers and proceedings in 1911 and has since been employed by half a dozen other American scientific and engineering societies. Fortunately for electrical workers, the international electrical units which we all use alike, as the volt, ohm, ampere, joule, watt, coulomb and henry, are already metric and need no parenthetical expression.

One of the discontinuities which keeps the minds of nations out of phase and synchronism is the lack of conformity between the units of weights and measures in the English-speaking countries on the one hand and the rest of the civilized world on the other. Leaving the European continent aside from consideration, Central and South America, with their twenty republics, are entirely bound up with the metric system in their everyday life. The total annual trade of the South American republics amounts in normal times to nearly $2,500,000,000 in money value. American workers desire to increase their trade relations with these metric countries. Any improvement in the service of the ELECTRICAL WORLD in South America would therefore benefit American electrical industries. Moreover, electrical engineers in foreign countries are usually prepared to wrestle with the difficulties of the English language provided that the units referred to in the text are their own international metric units. The change, however slight, will, we hope, help the cause of international relations everywhere.

A Good Public Servant

CHANGING conditions bring new problems, and they demand a new viewpoint and, if necessary, new men who understand them. For several decades the central station industry has forged ahead with obstacles clearly sensed and surmounted. It has formulated and followed large policies. Through a public policy committee it has been wisely advised. The public requirement of regulation has been met and accepted. Revolutionary improvements in generating apparatus and lamps have been absorbed into the operations without financial disaster and with marvelous benefit to the public in efficiency and economy in service. But other problems remain. It will not be easy to meet and answer all the questions of policy that lie ahead. In the present period of flux, strong, able counsel will be needed to guide company affairs. The government will want and need a free hand and a loyal support to anticipate its desires before they are even expressed. The public will expect the fullest consideration. And the companies, harassed though they may be by material shortage, by imperative demands requiring heavy exertions, must respond with breadth of mind in policy and detail. If there are risks, there are also opportunities to show what a good public servant does.

Control of Wireless

IT looks very much as if the government, always loath to interfere with legitimate private activities, would have in self-defense to take a very firm stand in assuming absolute control of the wireless activities of the country. Of course in an actual state of war such would be the first necessary step toward safety from illegitimate sending of information to the enemy; but in any event, at a period when hostilities are impending, it is high time that all wireless plants, big and little, should be put out of business or under the strictest kind of supervision. The great transatlantic systems are, of course, censored, but there is danger in some of the smaller installations. It is so simple a matter to string an aerial and to set up an equipment

capable of reaching 100 or 200 miles out at sea that too much care cannot be exercised in putting a stop at once and completely to everything of the kind. It is practically impossible to prevent the use of equipment for listening in on the government plants, so that the use of code is the only method of escaping espionage; but if the sending plants having any appreciable range of action were caught the chief source of danger would be removed. There have been from time to time reports of considerable installations in remote quarters, some of them doubtless fakes, others as certainly realities. The time has now come when the many legitimate experimenters with wireless will have to put up with some perhaps serious inconvenience in the interest of national security, and they should do it cheerfully and patriotically, lending their aid to such branches of government service as may be in need of them. There will be plenty of opportunity for their good offices in the near future. It is perhaps just as well that extreme measures have not been taken up to the present time, for the gains in the training of men in wireless work probably fully compensate the losses from such odd scraps of information as may have been passed about improperly. Time has now come, however, to put the lid on tight and to keep it on until the national crisis has passed. Every wireless equipment, dangerous if improperly used, can be of service to the government when confined to legitimate or patriotic functions.

Making Scattered Service Pay

WE have often in these columns raised the issue that a proper consolidation of electric service in small towns and villages could be made to pay when wisely administered. An interesting example of the working out of this thesis to a successful solution is given in the description by A. Hardgrave of the service of a little group of towns in the Middle West. There are five small communities concerned, with the main plant in the largest, which contains a population of 3500. The other four are scattered within five or ten miles and range from 400 to 700 in population. The interconnection of the service is accomplished through an iron line 22½ miles in length strung on cedar poles. The conductor is only No. 6, and with 25-ft. and 30-ft. poles, spaced forty to a mile, the line costs are evidently modest. The results are the best proof of the success of an enterprise of this sort. In the case before us on a total investment in the system of $16.50 per capita the gross earnings for the last complete year reported rose to $5.40 per capita, a figure of which some larger systems might be envious. The operating ratio was less than 60 per cent and the net earnings were more than 12 per cent on the investment. The four villages to which energy was distributed brought upon the station no additional operating force or station capacity.

Mr. Hardgrave very properly says that there are hundreds of such towns lying within easy reach of existing stations to which a modest but thoroughly good service could probably be extended. When a still larger group than that here considered is thus linked up into a united system the relative gains are still greater. It has more than once happened that isolated communities are glad indeed to bear in some form part of the expense of the extensions necessary to reach them, or at all events to guarantee enough load to justify the costs. A village must be isolated indeed that is not within fair reach of some electric system, and it certainly seems to be well proved that a paying load can generally be found even in an apparently insignificant community.

Publicity Problems

WHEN a central station executive considers a publicity campaign for the purpose of acquainting his community with the utility's affairs, he finds himself between two fires. If he advertises the fact that his company is making plenty of money, the unscrupulous will pervert his words to his disadvantage. His company will become known as a corpulent corporation. If he advertises that his company is not making money, he will increase the difficulty he already has in getting additional capital. It is on the horns of this dilemma that many well-intended general educational campaigns have fallen.

Such campaigns do not deserve to fall. The fact that the central station industry seems to lack the facilities for putting the public in a place to see the industry's problem from its own viewpoint, and that central station executives sometimes find difficulty in seeing things from the public's point of view, does not present insurmountable difficulties. It is a task, of course, to make the public understand the fundamental difference between the utility business and other big businesses. The public does not understand that a department store to make a 20 per cent net profit may make an average profit of only 4 per cent on its sales because it turns over its capital five times a year, while a utility company making perhaps an 8 per cent net profit turns over its capital only about once every five years. Such a proposition is difficult of comprehension to the wage-earner who in his life does not have "turn-overs" to contend with. It is also surprisingly difficult to explain to the average business man.

Since the central station industry realizes these facts, the natural optimism of its people should lead them to seek a different angle of approach for the publicity campaign. They might publicly propound the principle that a utility company must be prosperous if the city in which it is located is to grow; it must be prosperous if it is to do the things a utility should do for its patrons; it must be prosperous if it is to bear its share of the expense of civic improvements and at the same time attract new capital for its own betterments. That idea might provide one different angle which would allow a discussion of the necessity of prosperity of the company without speaking of rates. It should also be possible to present an admirable explanation of the adequacy of the

company's service without going into the details of the cost of producing that service.

After all, the things of vital importance to any community are the adequacy of the service provided to it, not the cost of producing that service, and the prosperity of its utilities, not the rates its citizens pay. Information on utility service costs should, of course, always be available to the public, but a publicity program might well omit these and be devoted to more vital topics.

Service and Public Ownership

IT is a fundamental of central station business that the thing actually sold is something more than electrical energy. Electricity nowadays is sold with an implied guarantee of perpetual good service, and it is the business of the operating company to see that the consumer gets it, and not to rest satisfied when a contract has been closed. This moral is vigorously enforced in the paper by Prof. C. E. Clewell on the relation of poor service to the propaganda for public ownership.

The interesting case which he cites is in its general character by no means infrequent, and its results are likely often to be duplicated. Briefly the situation was this. A small town with a run-down electric lighting system found itself taken over into the territory of a central operating plant covering considerable territory. The old plant was inefficient, equipped with antiquated meters, and loose and shiftless in its manner of billing. The new company came in, promising better light and cheaper service. It lowered its kilowatt-hour rate, installed new meters, and looked after its business efficiently. The result was in many instances an increase of monthly bills and a shower of protests from the patrons of the company.

Then the service in the town was carefully inspected by Professor Clewell himself, and recommendations were made for improvements. It was found that, although the substation voltage was kept well regulated, the old distribution circuits gave large variations from place to place. The voltage rating of the lamps was loose. Tungsten lamps were coming into use, usually installed bare in old fixtures, and in general the illumination was bad. The physical difficulties were remedied, lamp voltage was standardized, and some effort was made by the local solicitor to improve lighting.

The result of two years of these conditions showed in a formal petition for permission to establish a municipal plant on the ground that the service rendered was unsatisfactory, a petition on which the result of the hearings is now pending. Evidence at the hearings and investigation of conditions showed that the chief trouble in the community which served as a basis for complaints of poor service was that, while the distribution of electrical energy had improved, the community had not bettered the illuminating service and the company had not been sufficiently active in this cause to effect a change for the better that would have been neither difficult nor expensive if properly followed out.

It is all very well for the central station manager complacently to say that the people were at fault, but the proper use of light, especially when derived from the modern high-intensity lamps, is a matter involving technical skill which the community cannot fairly be expected to have. If the operating company does not institute a campaign for better illuminating engineering work, its customers are bound to be discontented and "easy marks" for politicians who may find it for their immediate benefit to institute a movement for municipal lighting.

The time has gone by when the salesman can take the attitude that his duties have been completed by getting the contract. His efforts must be backed up, and backed up vigorously, by the central station if it is to do its plain duty by its customers. The change from carbon to tungsten lamps brought an evil harvest of improper illumination. The change now in progress to the gas-filled lamps will produce even more serious results, and the company which neglects its illuminating service at this time may rest assured that it is thus sowing the seeds for the growth of complaints.

It is well for managers to realize that some consumers are first, last and always kickers, but on the whole the increase of complaints on an electric lighting system constitutes a serious indictment of the management. They are usually the result of following the policy of let well enough alone, when the fact is that in the march of improvement nothing can safely be left alone for any consideration. The case to which Professor Clewell calls attention was pushed to its legitimate conclusion rather more speedily than usual, but in the present temper of commissions and other regulating bodies there is trouble ahead for the company that does not follow up its sales of energy by persistent and intelligent service work among its customers.

The Coming Issues

AMONG the leading articles which will be presented in the operating issue of the ELECTRICAL WORLD for April 14 will be one giving the experience of a public utility company with the use of high-voltage aerial cable. The results which have been obtained with this installation have led the company to adopt aerial cable for all special work requiring transmission pressures as high as 26,400 volts. The third issue of April, which is the engineering number, will contain an article explaining methods of calculating values required in the layout and revision of direct-current networks and will point out the effects of adding new conductors to an existing system. In addition to central station commercial problems of a managerial nature, there will be taken up in the April 28 issue in symposium form the broad question of "Should the Central Station Make Free Repairs on Customers' Appliances?" There will also be the regular departments for the engineering and operating men.

Poor Lighting Promotes Public Ownership

Unsatisfactory Illumination Jeopardizes the Reputation of Commercial Central Station Service—A Lesson from a Pennsylvania Case in Which Change in Control Was Involved

BY C. E. CLEWELL

Assistant Professor of Electrical Engineering, University of Pennsylvania

IT is felt that illumination service is becoming an element of importance in central station work and that a neglect of this element may be the means of increasing the tendency to use poor light as an argument favoring municipal ownership. To illustrate this point, the difficulty experienced by a large company with the patrons in one of the boroughs included in its service is used as the basis of the following discussion.

As a matter of record it should be stated that the company concerned felt that, although testimony as to poor illumination was used by the applicant for a municipal plant, it had little, if anything, to do with the starting of the idea; but that it was unquestionably an exceedingly convenient argument with which to boost the case. It is to be noted also that the idea of a municipal plant was put under way immediately after the new company took over a very much run-down property and before it had time to get things into shape and to educate the customers properly in the use of light. Furthermore, in justice to the company it should be known that the difficulty experienced in this particular borough is not representative of the conditions in the remaining 98 per cent of the company's territory, where no such difficulty has been met.

This actual experience teaches the necessity of educational work in illumination.

"An interest must be taken in the way light is used," says the author.

"If this responsibility is avoided or neglected," he adds, "the company may find itself confronted unexpectedly in a hearing for a municipal plant by many witnesses who might have become satisfied customers."

Prevention is easier than remedy.

The underlying thought in this article, irrespective of any of these points, is that consumers better educated in the proper use of light will result in a lessened tendency for such a community to advance a poor lighting plea as a basis for any efforts which may be started for municipal ownership, particularly where the service of the public utility company is adequate and satisfactory in all other respects. The main purpose is thus to encourage active and intelligent efforts on the part of the companies to see that the good service extends all the way into the homes of their customers and includes efficient and suitable illumination as a distinct part of their program. With the foregoing points in mind it is believed that no injustice will be done to the company in question by a selection of one of the weak points in an otherwise excellent system, merely in order to use this case as an illustration of an influence which may be faced by others in applications for municipal ownership.

In May, 1915, the writer made an inspection of residence lighting conditions in the borough of Catasauqua, a municipality with a population of about 5000 situated in eastern Pennsylvania, for the purpose of discovering the basis of numerous complaints regarding the service. Two years later this borough filed a petition before the State Public Service Commission for a permit to install a municipal electric lighting plant. The hearing on this application took place on Feb. 8, 9 and 10, 1917, at Allentown, Pa. The history of this case is interesting in that it shows this rather new influence tending toward municipal ownership.*

Shortly before 1915 the old privately owned plant which supplied light and power to this borough was bought by the Lehigh Valley Light & Power Company, a central operating plant which supplies twenty or more municipalities in the eastern part of Pennsylvania in and about Allentown. About this time the Lehigh Valley Traction Company, operating a network of trolley lines in the same general section of the State, increased the fare between Allentown and Catasauqua from 5 to 10 cents, a step which was bitterly resented by the community affected. It is to be noted that one of the incentives offered by the Lehigh Valley Light & Power Company for its entry into this borough was better light, coupled with cheaper service, this feature being referred to repeatedly by the numerous witnesses for the applicant.

Antiquated meters and lax methods in rendering, modifying and collecting bills by the old company for several years prior to 1915 had given the consumers an incorrect idea of the actual value of the service rendered, and the installation of new and accurate meters about 1915 resulted in many cases in higher net monthly bills in spite of the decrease in the kilowatt-hour rate which was instituted by the new company. To the average citizen higher monthly bills were incompatible with reduced rates, and this, with the increased trolley fare, produced a widespread opinion that something was wrong, and in consequence the lighting service became the target of much criticism.

CHANGE IN LAMPS

At or about the date of the writer's inspection of these conditions there was a general substitution of tungsten lamps for the older carbon-filament lamps which had been used almost universally prior to that time. The inspection showed that bare tungsten lamps were being used without reflectors in many instances; in fact, among the residences of those making the chief complaints the use of bare unprotected tungsten units might be referred to almost as the rule at that time. Voltage records at the substation showed practically constant voltage, and graphic voltage records at one or

*The reference in these notes to the case of the borough of Catasauqua is made through the courtesy of A. H. S. Cantlin, vice-president and manager of the Lehigh Valley Light & Power Company, Allentown, Pa.

two typical service points indicated reasonably close voltage regulation during the evening hours.

It should be stated in fairness to the new company that the distribution circuits of the old company were in a very bad condition and these had been modified only slightly in 1915 at the time of the report. As a result, voltage readings on an indicating voltmeter at various service points indicated considerable variations from a standard value, although the substation voltage showed no appreciable variations during evening hours. The conditions in this borough in 1915 presented some very interesting features. A reduction in rates coupled with accurate meters was resulting in somewhat higher monthly bills in certain cases, and the substitution of the improved tungsten lamps for the old carbon-filament units was accompanied by bitter complaints against the service rendered. Poor light (with brighter lamps) and higher bills (with lower rates) were, in short, the text of practically all of the testimony from the large number of witnesses who occupied a great proportion of the time during the three days' hearing.

In further fairness to the new company, it may be stated that essentially all of the writer's recommendations were carried out during the two years following the inspection, and some strenuous efforts were made to conduct certain educational work among the consumers with which they themselves could remedy much of the bad lighting in their own homes. Even with these efforts and the many improvements made by the new company, public opinion favored a municipal plant, and in about two years after the central station began its service the application for the municipal plant was filed and the hearing conducted.

THE ESSENTIAL FEATURES SUMMARIZED

The essential features of the report on the lighting condition as found in 1915 have a bearing on what follows and are herewith summarized briefly as indicated below:

(1) Voltage regulation in substation at end of the high-tension feeders satisfactory.

(2) Graphic chart at typical service point shows satisfactory regulation.

(3) Indicated voltage readings in the residences show a considerable variation from a standard voltage. Distribution circuits probably at fault.

(4) Voltage rating of lamps employed shows wide variations.

(5) General use of bare tungsten lamps for residence lighting.

(6) Education among consumers should be started so that proper shades and reflectors will be used and the lighting rendered effective and pleasing for domestic purposes.

(7) Consumers should be told that lighting is best judged by the way the objects to be seen are illuminated, not by the glare from the lamps.

(8) Appearances indicate that the consumers are, in general, using tungsten lamps of sizes larger than necessary. Smaller lamps with suitable reflectors may actually result in improved illumination.

(9) Discourage the use of clear glass reflectors.

(10) Rearrange distribution circuits so as to supply some standard voltage to all residences.

(11) Standardize on some definite lamp voltage to correspond with the standard distribution circuit voltage.

(12) Instruct consumers to note that illumination depends on contrast. The illumination in the late afternoon, when the artificial light is mixed with daylight, may appear less satisfactory than after dark. Some of the complaints may be due to a cause like this.

CONSUMERS DID NOT PROFIT BY ADVICE

As suggested above, practically all of these recommendations were carried out by the new company in the two years which followed the original inspection. The service conditions were definitely improved, meters calibrated, distribution circuits placed in good working condition, feeder regulators installed on the high-tension lines, and a solicitor was stationed in the community to render what assistance he could in remedying minor complaints and in making suggestions for improved methods of illumination. The events of these two years showed very little disposition on the part of the consumers to profit by such advice, and it is doubtful if any material improvement was effected in the illumination of the homes, although many improvements were made in the external service conditions.

The three days' hearing of this case at Allentown was presided over by the chairman of the State Public Service Commission, and the numerous witnesses for the borough gave almost uniform testimony that the bills were higher and the service was poorer than formerly. There was, of course, much psychology in this testimony.

A community which was already prejudiced by a trolley fare increase, and still further wrought up by an intense feeling that an injustice of some kind had been done by the new lighting company in not reducing its monthly bills and in not materially improving the illumination, could easily work itself up to a belief in imaginary wrongs, and this was definitely proved in a number of cases where testimony as to consistent increases in monthly bills was shown to be false by the monthly record of individual charges which the company had available in court.

It is the special purpose of this article, however, to emphasize the very evident weakness of those responsible for the service in refuting the many statements as to the bad lighting. The accuracy or the inaccuracy of statements about monthly bills was easily checked and immediately refuted in some cases where necessary, on a basis of tangible records in the hands of the company's auditor. For all of the testimony about the bad lighting, however, there was difficulty in formulating an immediate answer which could be used to refute these arguments or critical statements. Many of them were obviously absurd, but, as far as the consumer was concerned, they were expressed as firm beliefs. A typical example will illustrate the idea which was expressed by consumers on this point.

"I FIND THE LIGHT WORSE WITH REFLECTORS"

One of the many witnesses for the applicant stated that his light was poor; "wasn't what it ought to be."

Question: "Do you use tungsten lamps?"

Answer: "Yes, in important parts of my hotel."

Question: "Do you use reflectors on these lamps?"

Answer: "No, I never use reflectors or shades; I find that the light is worse with reflectors than without them."

The actual conditions in this hotel in 1915 were about as bad from the lighting standpoint as one can well

imagine. Bare tungsten lamps were mounted on a relatively low ceiling, or were placed in low fixtures where bare carbon-filament lamps were formerly used. The question is, why, after two years, was this consumer not shown that such lighting conditions are atrocious and will always be so, no matter how perfect the station service may be made? In other words, why was he not shown that he, as a consumer, had a vital share to perform in the work of improving the illumination conditions in his own home or place of business?

Consumers Prejudiced

This is not said in criticism of the particular company in question. It had a difficult problem to handle and the class of consumers who made most of the complaints were almost impossible to deal with under the conditions of prejudice, the responsibility for which could not be placed entirely at the door of the new company at a time when every effort was being made to improve the bad state of affairs inherited from the old company. Furthermore, an aggravating feature was the fact that this small borough represented only a small percentage of the total load on the central station, so that the difficulties appeared to be exaggerated to those in charge of this division of the service.

It is evident, likewise, that these conditions of the complaints against poor light are found on every hand in other plants, although perhaps not in so pronounced a form, and hence this special case is given merely as typical. Looked at squarely, however, this case is strictly one in which poor illumination was a major factor in an application for a municipal plant. Poor illumination was a complaint placed at the door of the operating company, and the company was held responsible by the consumers in the community for this condition of affairs.

With better lighting conditions the tendency toward public ownership in this case could not have been so strong, since one of the principal features of the testimony of practically every witness for the applicant, as shown above, was complaint of bad lighting.

Central Station Must Give Illumination Service

It is the intention of this discussion to suggest that the central station must face the problem of improved illumination service if it wishes to avoid the difficulty experienced by this company. Systematic records and efficient methods in the auditor's office and competent service up to the meter are no longer the whole story. It is hardly proper to undertake a prophecy concerning the future based on an isolated case of this kind, but in this single instance the facts stand out forcibly.

The remedy must lie in educational efforts on the part of the public utility company. An interest must be taken in the way light is used in addition to the question of how much is consumed. If this responsibility is avoided or neglected, the company may find itself confronted unexpectedly in a hearing for a municipal plant by many witnesses who might have become satisfied customers, and it may pass through the not altogether pleasant experience of hearing from its own customers the charge of inferior service, which is likely to be an embarrassment, because often so impossible to answer, and because the Public Service Commission may look upon this condition as more the fault of the company than such a company has in the past been willing to admit.

HALFORD ERICKSON DISCUSSES FAIR RATE OF UTILITY RETURN

Former Chairman of the Wisconsin Commission Says That the Investors Appear to Require Occasional Extra Dividends

"In interpreting what is meant by the term 'fair return,' some hold that it is the return or cost at which the necessary capital for proper developments can be had; others say that the fair return is measured by the income basis upon which the existing securities of an enterprise, or similar securities of other enterprises, are selling in the open market. There are also many other views. The former of these two views seems to be in line with the best interests of both the public and the investor; the latter appears unjust to both." In these words Halford Erickson of Chicago addressed the Wisconsin Electrical Association.

In explaining his views Mr. Erickson said in part:

"Investors, in order to furnish capital on bonds on a 5 to a 5½ per cent interest basis, appear to require that the principal of such bonds shall be protected by property and equities worth not far from twice as much as the par value of the bonds; that the interest charges on such bonds shall be protected by net earnings that amount to about twice as much as such interest charges; that the future prospects of the road or utility shall be such that as far as can be judged the financial condition of the plant is likely to improve rather than otherwise; that the above income basis shall not, as a rule, include the cost of discounts, commissions and issuing expenses. Such expenses must, therefore, be borne by the plant in addition to the interest charges.

"The terms and conditions upon which investors are willing to furnish capital as developed from the prices at which the securities have been selling in the market, and from the value of the property and the amount of net earnings by which these securities had to be backed up in order to sell at such prices, apply for the most part to the larger and better-known railways and utilities. The securities of the smaller utilities under similar conditions as to the property and earnings by which they are protected sold at lower prices than those quoted, or at prices on which the yield obtained was considerably higher than the yields herein given.

Return Must Be at Least 8 Per Cent

"The full meaning of the facts which have been presented is best brought out when they are applied to specific cases. They indicate very closely that under ordinary conditions the roads and utilities, in order to meet the demands upon which the investor is willing to supply additional capital, must have net earnings for interest on the bonds, dividends on the stock and a surplus for safety; which altogether amount to not less than about 8 per cent on the fair value of the plant, its equities and business. With such net earnings as these and when the bonds do not cover more than from 50 to 75 per cent of the total value, the bonds would probably sell in the market on about a 5 to 5½ per cent income basis, while the stock would likely sell at prices on which the yield would amount to from 1 to 1½ per cent more than this. With a much lower net income than about 8 per cent on the fair value of the plant and its business, the plant could not, in the light of the facts here presented, very well be placed in the investment class."

Small-Town Interconnection That Paid

How Iron-Wire Transmission Lines and Inexpensive Distribution Systems Were Employed to Serve Small Communities That Would Otherwise Prove to Be Unprofitable Consumers for the Company

BY A. HARDGRAVE
Construction and Operation Engineer, Middle West Utilities Company

ACCORDING to the United States Census of 1910, there are in this country 12,956 incorporated towns with less than 5000 population each and with a combined population of 12,224,000, or 13.3 per cent of the total population of the United States. Eleven thousand seven hundred and eighty-four of these communities, with a combined population of 8,118,825, or 8.8 per cent of the total population of the United States, have fewer than 2500 inhabitants each. A great number of these towns are supplied from isolated electric plants, and with night service only, while many are not receiving the benefits of electric service at all. In order to serve these small communities profitably a system of transmission and distribution lines must necessarily be designed and installed at a cost proportional to the revenue which can be secured. As a general rule the ratio of investment to the annual gross revenue must decrease in direct proportion to the size of the community.

The commercial transmission and distribution of electrical energy in small properties present many more complex problems than are found in properties in larger cities. The word "commercial" has been used in this instance to differentiate between the use, on the one hand, of high construction and operating standards, which may be termed high-class engineering, carrying high initial investment costs and annual fixed charges, and, on the other hand, of systems constructed and designed at a moderate cost, commensurate with the development possible in the smaller towns. This in many cases is the difference between profitable and losing ventures in this class of properties.

The average small town, ranging from 500 to 2500 population, does not offer the opportunities for development existing in larger cities, and consequently the revenue received per capita or per customer is much less. It is therefore necessary to limit the investment in such towns in proportion to the revenue received, taking into consideration in each case the cost of production and distribution. It is purely a question of economics, and due consideration should be given to the fact that as a rule such communities do not have the rapid increase in population which is constantly going on in larger cities and industrial centers. In fact, many such communities have not increased in population during the last decade. Therefore in this class of towns great care should be exercised when designing and laying out transmission and distribution systems to keep in mind the fact that in most cases development is limited to existing business and does not depend upon the town's future growth. It is usually necessary and profitable in large cities to construct transmission and distribution lines not only for the present requirements but with sufficient capacity to provide for future growth. In such cases a very high degree of saturation can usually be obtained. This is, however, not true in small properties, and therefore systems must be installed at moderate cost if profits are expected for the investors.

To bring out more clearly the conditions which affect the economy of small-town interconnection a specific case may be instanced. The property consists of five small communities interconnected with a 22.5-mile (36.2-km.) 13,200 volt transmission line constructed with No. 6 B. B. galvanized-iron wire strung on 25-ft. (7.62-meter) and 30-ft. (9.15-meter) cedar poles spaced forty to a mile (approximately 25 per km.) Half the line is single-phase and the rest three-phase. The power station, which consists of high-speed, non-condensing units and return tubular boilers, is situated in the largest town of the group, with a population of 3500.

The other four towns, lying within five to ten miles (8.05 km. to 16.09 km.) of the central station, are of 400 to 700 population. The total investment in the system amounts to approximately $16.50 per capita. The gross and net earnings per capita for the year 1915 amounted to $5.40 and $2.27 respectively, notwithstanding the fact that during the period one of the small towns was receiving dusk-to-midnight service from an isolated oil-engine plant. The operating ratio for the year was 58.2 per cent, while the net earnings amounted to 12.57 per cent of the investment.

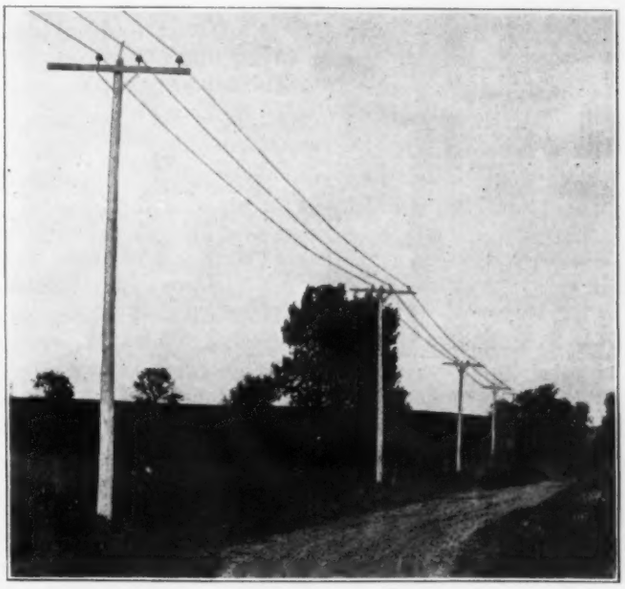


FIG. 1—TYPICAL 13,200-VOLT IRON-WIRE LINE IN SPARSELY SETTLED DISTRICT

The total investment apportionable to the four small towns, including the 40-kw. station rating and 12 per cent supervision and engineering charges, amounts to $11.31 per capita, as against $16.50 per capita for the entire group.

The gross earnings for three of the towns for the year amounted to $7,044, or $4 per capita. The total operating expenses and taxes, including energy at 2.85 cents per kw.-hr., amounted to $1,896. The

net earnings for the year amounted to $5,148, which is equivalent to a return of 20.5 per cent on the investment. The net earnings from these towns amounted to about 40 per cent of the total net for the entire system.

The value of the four small villages to the initial property can be fully realized when it is understood that no additional operating force or additional station ca-

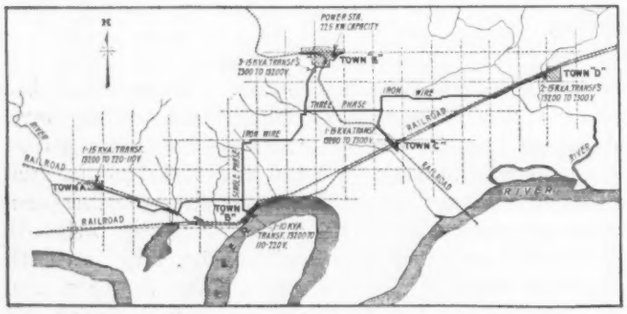


FIG. 2—COMMUNITIES THAT WERE INTERCONNECTED BY IRON-WIRE LINE

pacity has been required. In this specific instance the three-phase transmission line cost approximately $450 per mile ($280 per km.), while the single-phase line, exclusive of the right-of-way, cost $386 per mile ($240 per km.).

Notwithstanding any criticism which might be made concerning the use of this class of construction, the actual losses on the system are under 20 per cent. One of the most important factors to consider is the profitable showing on the balance sheet.

Other similar groups of properties with which the writer is familiar are to-day laboring under extremely heavy fixed charges owing to large initial investments in high-class transmission and distribution systems—a class of construction which is entirely unjustified in such communities. In such towns using high-class ex-

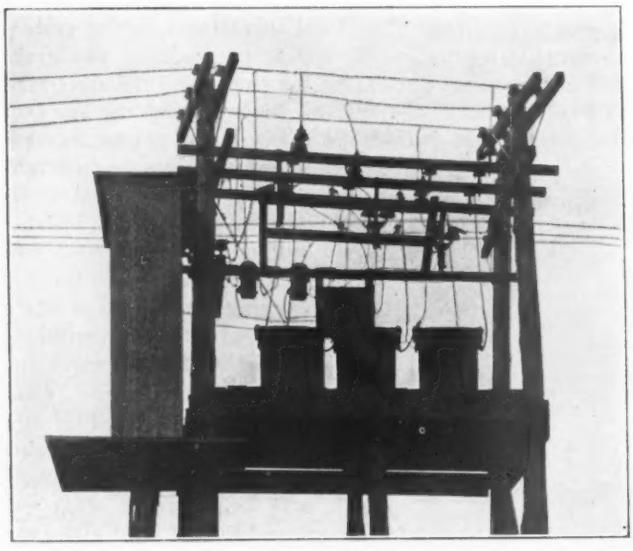


FIG. 3—OUTDOOR TRANSFORMER STATION SERVING ENTIRE TRANSMISSION SYSTEM

pensive methods the total transmission losses have not decreased, the maintenance is no lower, and the continuity of service is no better than that of the small iron-wire transmission system heretofore referred to.

There are to-day hundreds of towns ranging in population from 300 to 2500, lying within commercial-transmission distance of existing stations and transmission lines, that are entitled to and should enjoy the advantages of twenty-four-hour unlimited supply of electrical energy. Obviously, if such small towns are to enjoy these advantages it is essential to provide transmission and distribution lines and equipment at much lower cost than has previously been done. No doubt, when the value of such communities to existing systems is fully realized, manufacturers and engineers will be quick to design and provide lower-cost equipment and material, and thereby make possible the development of these small towns.

The grouping of small properties in this manner diversifies the financial risk of the business, gives greater stability to the entire financial structure, and makes the

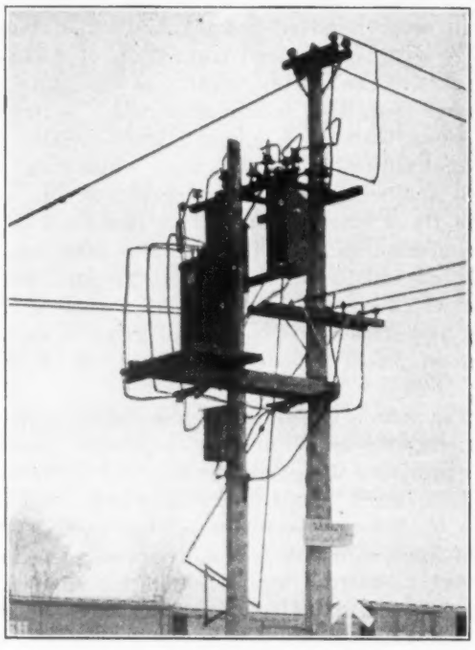
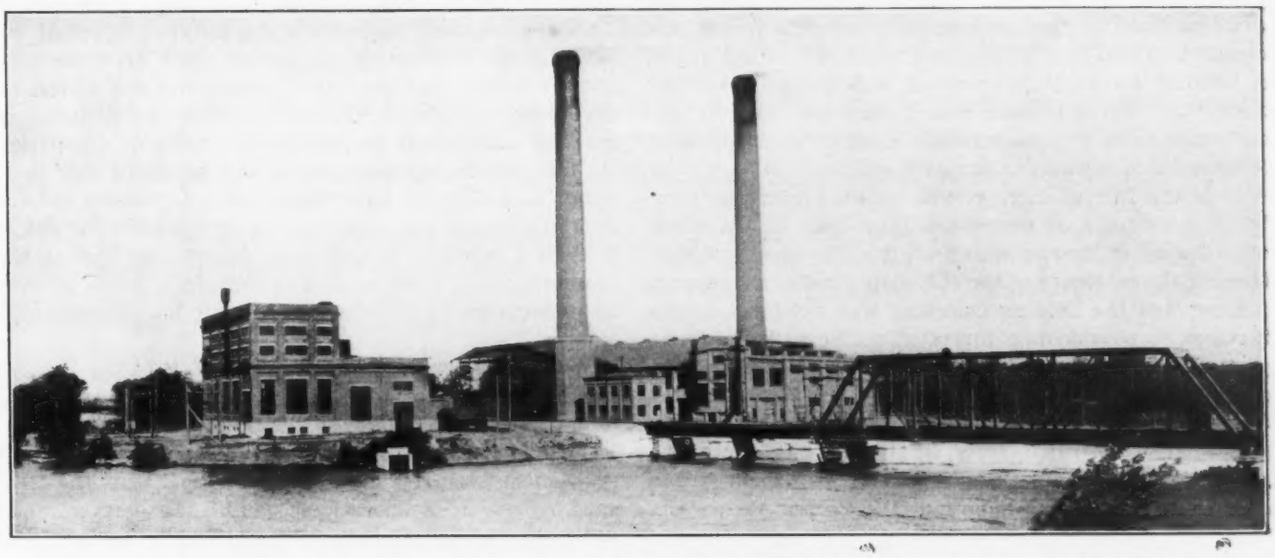


FIG. 4—TYPICAL OUTDOOR TRANSFORMER AND SWITCHING STATION SERVING SMALL COMMUNITY

securities of such companies more attractive to the investor. It may be readily seen, therefore, that concentration of management in both production and distribution is, considering the present development of generating and distributing apparatus, the essential economic factor that makes for successful and profitable operation of small properties.

Reducing Use of Gasoline to Safeguard Workmen

To safeguard its workmen the street department of the Commonwealth Edison Company has abandoned the use of gasoline where possible and in its place is using kerosene, which is considerably safer. The increased cost of gasoline was also a factor, but a comparatively unimportant one. Under the present arrangement gasoline is used only for operating engine-driven pumps and by the cable splicers for washing their hands. Each splicer is allowed a 1-gal. (3.785-l.) can for this purpose. All furnaces and torches are operated on kerosene. With the elimination of gasoline came an attempt to make the handling of kerosene safer by providing cans with special safety tops like those commonly used on gasoline cans.



MAIN GENERATING STATION OF THE EMPIRE DISTRICT ELECTRIC COMPANY AND AUXILIARY STEAM PLANT—A TYPICAL HOLDING COMPANY INVESTMENT

Enlarging Field of Holding Companies

Tendency of Financing Corporations to Step Beyond Control of Public Utility Operating Companies and Engage in Independent Industrial Activities Not Subject to Regulation

HOLDING companies occupy a position of large importance and influence in the public utility industries. They have developed phenomenally in both the number and the extent of their operations, and there are no present indications that the movement which they represent will be lessened in scope. Like other forms of corporate ownership, they are of course open to abuse or to the alternative of progress along recognized lines of economic value to the community. If the lines of their growth are guarded with care, they are capable of rendering useful service to the operating properties in physical standardization and in economy of operation and financing. If they are directed with a loose regard for their obligations to the public, they will bring serious disaster to the public utility industries in which they now have so powerful a part.

The purpose of the "Electrical World" is to call attention to a developing movement which, if applied generally, will substantially alter the character and position of holding companies.

While other properties are embarking in similar activities, the most conspicuous example is the Cities Service Company. It has done more in this direction than any other of the large holding corporations.

The latest significant development in the operations of these aggregations of utilities has such far-reaching possibilities that it merits special attention at this time. This tendency is turning the holding companies toward investment in fields of industry somewhat allied but not directly connected with their primary operations. It is leading them to supplement their ownership of public utility properties by extension to activities which are more private than quasi-public in nature and are hence not subject to regulation. Such activities are, in fact, a further application of the principle of investment, which is one of the best reasons for the existence of the holding type of company—that is, the distribution of risk.

The average holding company of the character under consideration here has its subsidiary operating companies situated in a number of different localities in the country. By thus diversifying its investment interests it lessens the chance that all may be affected in the event of unexpected depression. The business selection of properties in, say, cotton-growing districts, general agricultural communities, mining centers, specialized manufacturing districts and iron and steel industrial communities widely separated geographically will almost certainly result in combined fair average gross returns; it is extremely unlikely that reaction in business conditions would affect a great many communities, remote from each other, so unfavorably that all of their public utilities would suffer at the same time.

Another consideration has an equally important bearing when "boom" times come. Then the thriving state of industry causes more than the normal increase in the use of public utility service, and there is a very good chance that some properties will make exceptionally large gains in gross earnings. Just which of the properties will make these gains is a question of prophecy until the facts are revealed, but the prospects are always there. A special demand, due to unusual market conditions affecting the products of a particular community, will attract a prosperity to it which will be

reflected in the mounting gross earnings of the public utilities serving that community. And it is not uncommon to find that at the time when one subsidiary of a holding company is showing a large gain another subsidiary, owing to some local disturbance entirely disconnected from general business conditions, is suffering a decrease of noticeable proportions.

It is the fair average return secured from the combined operations of properties thus open to the effect of different influences which affords the best justification for the existence of the stabilizing holding company.

Long ago the holding company was extended to the three most conspicuous forms of public utility service generally furnished by private capital, that is to say, electric central station, artificial gas and electric railway. Naturally the electric central station has been a particularly desirable form of investment for these companies because its normal rate of growth is larger than that of the gas company or the electric railway

ENLARGEMENT OF HOLDING COMPANY ACTIVITIES

It is only recently that the field of activity of the holding company, based primarily on investment in public utilities, has been enlarged still further. This enlargement of activities is still a matter of experiment with some properties, although with others it is held to be a definite policy and an assured success. In addition to the companies which have actually gone into additional forms of industry, others have similar enterprises under consideration and still others are believed to be looking into the possibilities offered.

The Cities Service Company is the most conspicuous of the holding companies which have gone into a new class of business on a large scale. This company has introduced into its operations an element of possible profit which has turned out to be of far greater importance than any other operations of current times in the stable and regulated public utility industries. Following a settled policy formed several years ago, this company has stepped logically from the production of natural gas, which it was furnishing to several communities in the West, to the production of petroleum.

Drilling for natural gas, one of its subsidiary properties found oil in large and profitable quantities. Controlling large areas of land which were capable of producing both natural gas and petroleum, it then took the second step of purchasing refineries in order to treat its crude petroleum. Later there followed the most recent action of the company in acquiring control of an old-established corporation engaged in marketing petroleum products in world-wide markets, the Crew-Levick Company, the headquarters of which are in Philadelphia.

THEORIES OF MR. DOHERTY

An official of the Cities Service Company states to the ELECTRICAL WORLD that the policy of entrance into a new industry was not haphazard or accidental. Many years ago Henry L. Doherty, president of the company, formed theories that the location of deposits of natural gas and petroleum would be found by study of geological strata. With the organization of the Cities Service Company and its successful development of subsidiary natural gas properties in the Kansas fields it was decided to conduct practical experiments along the lines suggested by the theories developed by Mr. Doherty a number of years ago.

One of the first steps was the purchase of control of some companies producing natural gas. This was in 1912, and it was taken with the definite object of enlarging the production of natural gas, of conserving the production and use of this commodity and of testing the theories that, in connection with the deposits of gas, oil also would be located in profitable quantities. At the time the company began operations of this character a geological department was organized in the Doherty Operating Company, which operates the Cities Service Company. Where this department had at the beginning only three men, it is significant of its growth in importance to the company that it has at present a total of 150.

While drilling for gas in the fall of 1914 the Empire Gas & Fuel Company, a subsidiary of the Cities Service Company, discovered oil in the so-called Augusta field, Kansas, in which it had large holdings. As a result of subsequent geological study and practical tests the company enlarged its operations steadily until it now has 144 wells in the Augusta field and 386 in another district, known as the Eldorado field. With these extensive interests the Empire Gas & Fuel Company has become one of the largest producers of oil in the country. To supplement the petroleum-producing activities thus assured the Cities Service Company purchased the stock of six refining companies and practically all of the stock of the Crew-Levick Company, which, although also a producing and refining company, is essentially a distributor of petroleum products. The latter company will add petroleum-carrying steamships to its plant so as to provide better for its European markets.

CO-OPERATION WITH UNIVERSITIES IN RESEARCH

In conjunction with the operations in gas and oil fields the Cities Service Company, for the purpose of conducting research work, has co-operated with the staffs of the technical universities in the sections in which the gas and oil fields are situated. Its electrical engineers have worked with the oil operators to enlarge the possibilities of pumping by electrical energy, a development of recent years which is believed to promise economical and desirable results.

A similar extension of activities by the United Gas & Electric Corporation is the purchase of an interest in a natural gas and oil development, situated chiefly in Louisiana, but partly in Mississippi, Texas, Oklahoma and Kansas. This investment comprises an interest in Louisiana Gas & Fuel Company, Inc., bonds and stock.

Other public utility holding company interests which have made definite plans for entering fields of activity outside of the old scope of operations have not in all cases announced their arrangements publicly. Some of these, however, are giving careful study to the subject and have expended money in experimental work. The high prices prevailing for petroleum products and the continued demand from consumers in those markets have turned attention in that direction. Holding-company interests have been investigating conditions in the oil producing, refining and marketing industries to measure the possibilities and the danger of investment after so great an expansion and rise in selling prices as have taken place recently.

In other directions also investigations are in progress to determine what allied lines of industry can be conducted profitably in connection with public utilities. Progress has been made, and it is evidently only a question of time when actual developments will follow.

Output of Large Generating Systems

Approximately Two-thirds of the Central Station Energy of the Country Generated by Forty-one Companies, Chiefly in Hydroelectric Stations—Increase More Than 2,000,000,000 Kw-hr. for Year

STATISTICS for 1916 on the outputs, peak loads and load factors of the largest generating systems of the country are given in the accompanying table. The total output of the companies listed was 17,500,000,000 kw.-hr., the combined outputs of the companies in the United States approximating 15,500,000,000 kw.-hr. The greater part of the electrical energy was generated from water power. Similar statistics for the years 1915 and 1914 were published in the ELECTRICAL WORLD of March 11, 1916.

With two exceptions, every one of the companies shows an increased output over 1915. Instances of increases due to war conditions are to be noted in the cases of the three Canadian companies (the Ontario Power Company of Niagara Falls, the Shawinigan Water & Power Company and the Toronto Power Company) and of the Montana Power Company, the Detroit Edison Company, the Duquesne Light Company, the Utah Power & Light Company, the Philadelphia Electric Company and the Public Service Electric Company of New Jersey.

Returns from three companies not heretofore listed in this compilation, the Cleveland Electric Illuminating Company, the Virginia Railway & Power Company and the Empire District Electric Company, are published for the first time. As has been the case for a number of years now, the Commonwealth Edison Company of Chicago shows a larger output than any other generating company in the country and may claim without question the distinction of being the largest generating company in the world.

The figures for the Ontario Power Company have to do only with the energy actually produced in its own station. The company purchased in addition a large

DATA ON OUTPUT AND LOAD FACTOR OF LARGEST GENERATING SYSTEMS IN AMERICA

System	1916				1915			
	Peak Load (Kw.)	Date of Peak Load	Yearly Output (Kw.-Hr.)	Yearly Load Factor (per Cent)	Peak Load (Kw.)	Date of Peak Load	Yearly Output (Kw.-Hr.)	Yearly Load Factor (per Cent)
Commonwealth Edison Company	369,740	Dec. 19	1,341,964,000	43.20	337,900	Nov. 29	1,198,636,900	42.50
Niagara Falls Power Company	143,360	Nov. 24	1,015,525,680	80.64	126,320	Dec. 27	899,427,550	81.28
Ontario Power Company of Niagara Falls	123,900	Oct. 12	942,221,900	86.80	.....	.....	757,713,600	.....
New York Edison Company & United Electric Light & Power Company	254,824	Dec. 20	856,385,319	38.30	239,416	Dec. 6	740,873,162	35.30
Montana Power Company	149,740	Dec. 19	867,940,326	84.50	89,000	Dec. 20	489,831,218	84.10
Pacific Gas & Electric Company	141,008	Dec. 19	768,304,907	62.20	139,540	Dec. 1	725,715,620	59.40
Hydraulic Power Company	89,275	Dec. 26	717,079,320	91.50	87,395	Dec. 16	695,619,456	91.00
Toronto Power Company	129,000	Dec. 20	660,873,579	58.40	102,000	Dec. 29	348,000,000	39.00
Public Service Electric Co. of N. J.	174,000	Dec. 14	608,018,729	39.82	143,000	Dec. 10	490,684,988	37.73
Detroit Edison Company	130,200	Dec. 19	546,925,300	47.80	101,800	Dec. 17	393,129,850	44.10
Tennessee Power Company	81,650	Dec. 14	483,354,162	67.00	*	.....	.....	.....
Shawinigan Water & Power Company	108,000	Dec. 14	478,540,000	50.00	*	.....	.....	.....
Duquesne Light Company	101,000	Dec. 21	463,537,660	52.30	83,000	Nov. 29	347,514,317	48.00
Philadelphia Electric Company	142,260	Dec. 12	444,785,884	35.6	*	.....	.....	.....
Pennsylvania Water & Power Company	77,000	.....	417,837,600	61.8	76,000	Dec. 12	.....	51.90
Utah Power & Light Company	68,894	Dec. 6	412,726,000	67.8	.....	.....	.....	.....
Great Western Power Company	74,100	Dec. 14	408,391,067	62.65	62,100	Nov. 15	337,264,400	62.00
Mississippi River Power Company	82,400	Nov. 27	393,400,000	54.3	77,300	Nov. 18	370,330,660	54.60
Pacific Light & Power Corporation	82,765	Dec. 22	376,308,731	51.76	76,150	Oct. 28	316,098,189	47.39
Puget Sound Traction, Light & Power Co.	77,030	Nov. 28	353,697,263	51.8	66,000	Dec. 30	295,766,712	51.20
Cleveland Electric Illuminating Co.	84,999	Oct. 25	340,670,721	45.8	*	.....	.....	.....
Electric Company of Missouri, Union Electric Light & Power Co.	88,544	Dec. 11	333,964,652	43.1	76,303	Nov. 29	308,759,186	42.60
Commonwealth Power, Railway & Light Co.	.....	.....	315,964,337	.....	66,930	Dec. ..	245,300,654	42.50
Southern California Edison Company	60,930	Dec. 28	299,950,513	56.04	56,625	July 13	286,985,095	57.80
Buffalo General Electric Company	65,500	Dec. 14	299,306,640	57.00	62,460	.....	273,950,000	.....
New England Power Company	64,000	Dec. 12	246,000,000	44.00	49,300	Dec. 29	172,863,764	40.05
Edison Electric Illuminating Co. of Boston	80,539	Dec. 12	238,557,144	33.72	72,802	Dec. 13	208,358,400	32.70
Edison Electric Illuminating Co. of Brooklyn	67,200	Dec. 19	233,452,500	38.1	62,000	Dec. 23	188,516,851	34.70
Wisconsin Edison Company, Milwaukee Electric Railway & Light Co.	64,170	Dec. 5	218,421,711	39.00	52,458	Nov. 19	158,089,543	35.00
Portland Railway, Light & Power Co.	47,335	Nov. 29	194,146,555	46.5	47,150	Dec. 30	186,372,553	45.10
Sierra & San Francisco Power Company	.....	.....	191,620,000	.....	40,560	Feb. 26	190,147,804	53.50
Alabama Power Company	40,500	Dec. 11	184,345,360	51.07	28,750	Dec. 21	123,882,040	48.00
Georgia Railway & Power Company	.....	.....	172,000,000	.....	77,100	Dec. 17	179,976,596	26.65
Minneapolis General Electric Company	43,640	Dec. 14	171,672,890	44.9	33,100	Dec. 6	128,941,588	44.50
Great Northern Power Company	38,200	Nov. 21	163,807,560	48.8	32,000	Nov. 23	142,249,020	50.80
Washington Water Power Company	30,440	Dec. 14	162,825,400	60.80	28,691	Jan. 20	165,913,500	66.00
Adirondack Electric Power Corporation	41,575	Dec. 12 & 22	151,128,310	41.40	38,400	Dec. 13 & 29	128,640,000	38.20
Rochester Railway & Light Company	40,250	Dec. 16	146,069,428	41.00	37,000	Dec. 15	123,401,451	38.00
Toledo Railways & Light Company	36,428	Dec. 22	134,842,360	42.2	33,373	Dec. 31	100,168,375	.....
Virginia Railway & Power Company	33,900	Dec. 18	132,275,000	44.54	*	.....	.....	.....
Southern Sierras Power Company, Nevada-California Power Company	22,400	April 28	131,084,265	66.5	20,300	July 29	114,187,385	64.20
Potomac Electric Power Company	38,600	Dec. 18	122,158,818	36.1	36,200	Nov. 30	111,082,725	35.03
Empire District Electric Company	26,900	Mar. 26	119,280,363	49.7	*	.....	.....	.....
Southwestern Power & Light Company	25,600	Oct. 5	95,740,000	43.0	16,600	Dec. 22	87,089,000	44.00
Southern Power Company*	.....	.....	.....	.....	.....	.....	.....	.....

*No data received.

amount of energy from outside sources and therefore actually handled and delivered very much more than the figures given would indicate. It will be noted that the load factor of the Hydraulic Power Company of Niagara Falls is this year 91.5 per cent. This figure was obtained by using the average output for the whole year compared with the highest single reading for the year. The company reports that its ordinary daily load factor is usually above 98 per cent. In the case of the Commonwealth Power, Railway & Light Company the returns for 1916 show the actual sales of electricity in kilowatt-hours rather than the amount generated.

All of the companies have, of course, felt the increased cost of material and labor, and with one or two exceptions all of the steam generating systems have suffered considerably for want of coal and also because of the great increase in the price of it. The hydroelectric stations at Niagara Falls and also those in the West are still handicapped by want of legislation which will enable them to use water power up to their needs and to take care of increasing demands on their systems. It is hoped that the session of Congress now convened may grant relief in water-power matters, especially as the coal situation is bound to become more and more acute.

Having a wider diversity of uses for electricity than any other section of the country, the Pacific Coast companies still enjoy much better load factors than the companies in the interior states and along the Atlantic seaboard.

In view of the high cost of material, which has compelled many companies to keep down extensions, the outputs recorded are most excellent. They indicate more intensive development on the part of the various companies.

THINGS TO CONSIDER WHEN MAKING LINE EXTENSIONS

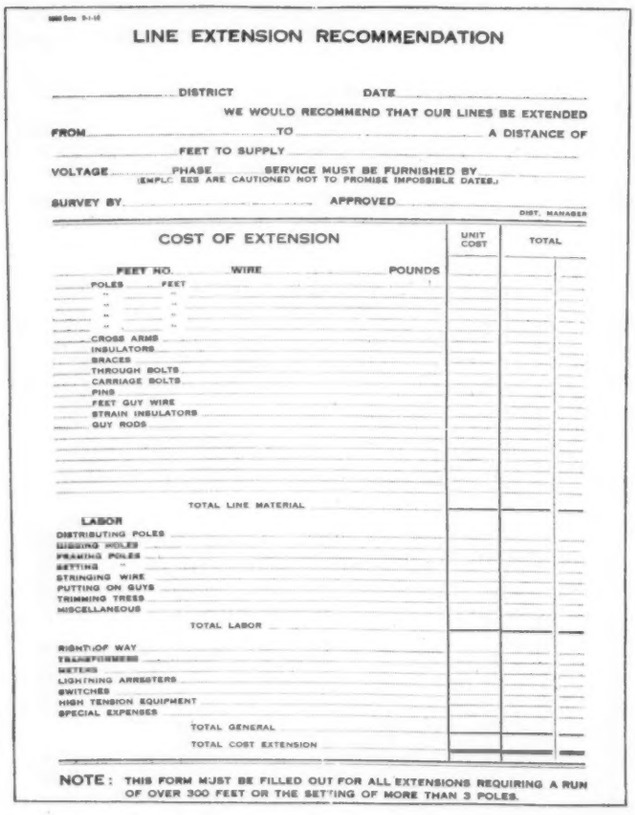
Three Points That Should Be Borne in Mind by Managers to Avoid the Losses Due to Lack of Fixed Policy and Preliminary Investigation

BY R. A. LANGWORTHY

Many existing distribution lines are being operated at a loss because they were built without proper preliminary investigation and without any fixed policy regarding line extensions. To avoid making such unprofitable investments, therefore, three things become necessary:

(1) The adoption of a standard policy as to the return required from any proposed line extension; (2) a system of investigation, report and approval for a particular extension which will compel the gathering of proper data and their submission in such a way as to allow of easy inspection and checking before approval by the proper executives; (3) no extensions or promises of them should be made until an approval has been received. If a proper system is worked out covering the three points mentioned most of the troubles attending line extensions will be avoided, thereby saving money and strengthening the prestige of the operating company.

While the system described in what follows was worked out for the use of a large company, it should be of interest also to smaller companies. With holding companies, the requests for line extensions are usually brought to the attention of a local manager, who perhaps has already made up his mind that the extension should or should not be made, so that his subsequent decisions may be biased. However, if this man only collects the



LINE EXTENSION RECOMMENDATION

_____ DISTRICT DATE _____

WE WOULD RECOMMEND THAT OUR LINES BE EXTENDED

FROM _____ TO _____ A DISTANCE OF _____ FEET TO SUPPLY _____

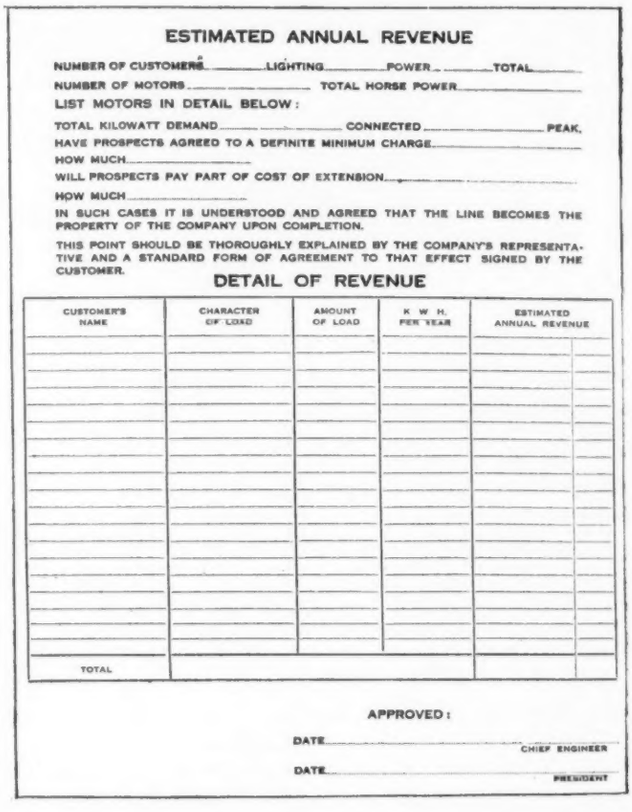
VOLTAGE _____ PHASE _____ SERVICE MUST BE FURNISHED BY _____
(EMPLOYEES ARE CAUTIONED NOT TO PROMISE IMPOSSIBLE DATES.)

SURVEY BY _____ APPROVED _____
DIST. MANAGER

COST OF EXTENSION

	FEET NO.	WIRE	POUNDS	UNIT COST	TOTAL	
_____ POLES	_____ FEET					
_____ "	_____ "					
_____ "	_____ "					
_____ "	_____ "					
_____ CROSS ARMS						
_____ INSULATORS						
_____ BRACES						
_____ THROUGH BOLTS						
_____ CARRIAGE BOLTS						
_____ PINS						
_____ FEET GUY WIRE						
_____ STRAIN INSULATORS						
_____ GUY RODS						
TOTAL LINE MATERIAL						
LABOR						
DISTRIBUTING POLES						
DIGGING HOLES						
FRAMING POLES						
SETTING "						
STRINGING WIRE						
PUTTING ON GUYS						
TRIMMING TREES						
MISCELLANEOUS						
TOTAL LABOR						
RIGHT OF WAY						
TRANSFORMERS						
METERS						
LIGHTNING ARRESTERS						
SWITCHES						
HIGH TENSION EQUIPMENT						
SPECIAL EXPENSES						
TOTAL GENERAL						
TOTAL COST EXTENSION						

NOTE: THIS FORM MUST BE FILLED OUT FOR ALL EXTENSIONS REQUIRING A RUN OF OVER 300 FEET OR THE SETTING OF MORE THAN 3 POLES.



ESTIMATED ANNUAL REVENUE

NUMBER OF CUSTOMERS _____ LIGHTING _____ POWER _____ TOTAL _____

NUMBER OF MOTORS _____ TOTAL HORSE POWER _____

LIST MOTORS IN DETAIL BELOW:

TOTAL KILOWATT DEMAND _____ CONNECTED _____ PEAK _____

HAVE PROSPECTS AGREED TO A DEFINITE MINIMUM CHARGE _____

HOW MUCH _____

WILL PROSPECTS PAY PART OF COST OF EXTENSION _____

HOW MUCH _____

IN SUCH CASES IT IS UNDERSTOOD AND AGREED THAT THE LINE BECOMES THE PROPERTY OF THE COMPANY UPON COMPLETION.

THIS POINT SHOULD BE THOROUGHLY EXPLAINED BY THE COMPANY'S REPRESENTATIVE AND A STANDARD FORM OF AGREEMENT TO THAT EFFECT SIGNED BY THE CUSTOMER.

DETAIL OF REVENUE

CUSTOMER'S NAME	CHARACTER OF LOAD	AMOUNT OF LOAD	K. W. H. PER YEAR	ESTIMATED ANNUAL REVENUE	

data and sends them in detail to the higher executives for approval, a much better decision results for the following reasons:

(1) A larger number of the men in the organization will pass upon the proposition, or by applying the old saying "two heads are better than one"; (2) the men higher up, being unfamiliar with all local details, are in better position to pass on the cold, hard facts presented without sentiment or prejudice.

The adoption of a standard policy varies somewhat with different organizations. As a general rule, however, it should be required that the gross revenue from an extension shall pay therefor in from two to three years. One company has decided to "pay out" in one year, but this policy in some cases proved unsatisfactory and discouraged a lot of good business. In the opinion of the writer, a policy of "paying out" in two and one-half years will take care of nearly all ordinary conditions and permit taking on all proper business. The adoption of a definite policy, known to all employees, will prevent the building of unprofitable lines and what is nearly as bad the promise of extensions when they cannot be financially considered and when later a refusal to build will cause resentment and injure the standing of the company in the community.

Having adopted a policy, the next step is to provide a system whereby extensions can be made only after careful investigations, estimates of cost and revenue and approval by the proper executive have been made. A form devised by the writer for the purpose of making recommendation for line extensions is shown in Figs. 1 and 2. The front of the sheet, shown in Fig. 1, contains spaces for itemized estimates on the cost of the extension, while space on the back (Fig. 2) is provided for estimates of the revenue. Since both estimates are made out in detail they may be readily checked by any one as an assurance that the cost of the work has not been over- or underestimated. In making estimates of the revenue it is required that an actual canvass of the prospective customers be made and provisional contracts signed. These arrangements are shown in detail in Fig. 2, together with the minimum amount guaranteed in part payment of the cost of the line, etc. With this form, properly filled out, the approving executive can promptly and accurately gage the situation, check any of the details and pass upon the extension with a minimum of risk.

In the organization for which this system was devised the local managers report direct to a district manager, who in turn is responsible to the main office. The forms are made out in triplicate by the local managers, who forward them to the district manager. When they are approved by him they are forwarded to the main office for the respective signatures of the chief engineer and the president. If the extension is approved, the original copy is retained for the main office records and the other two copies returned to the district manager. One of these is retained by him and the third copy returned to the local manager, thereby authorizing him to proceed with the work. The system requires a minimum amount of labor and "red tape," provides for proper inspection and approval by different officials, leaves a record in the files of all persons who should have information thereon, protects the company against "wildcat" extensions, and withal is simple and easily understood and applied. In actual practice it has worked out very satisfactorily.

DATA AND OPINIONS ON UNDERGROUND PRACTICE

Cable Jointing and Ventilation of Underground Electrical Equipment Discussed at Committee Meeting of Ohio Electric Light Association

Ventilation and construction of manholes, laying and splicing of cables, and the trend of engineering opinion and practice on underground systems were among the topics discussed at a recent meeting of the transmission and distribution men of the Ohio Electric Light Association. To ventilate its underground system one company has installed a pipe from the top of the manhole to a point near a building, at which point it is extended above the ground to emit gases and warm air. Another company found it necessary at times of excessive heat to tear up the paving and spray water on the surface of the ducts. An artificial cooling system in which water was circulated around the walls of a manhole containing heavily loaded cables created considerable comment. According to opinions expressed, 125 deg. Fahr. (51.7 deg. C.) is a dangerous temperature for cables. F. Kendig, Dayton Power & Light Company, said he found that whenever steam mains are close to underground cables it is advisable to replace varnished-cambric insulated cables with paper-insulated cables.

Owing to the fact that there is a tendency for city officials to limit the sizes of manholes, this topic was discussed at length. A popular size seemed to be 7 ft. (2.13 meters) by 9 ft. (2.74 meters) by 8 ft. (2.44 meters) deep. The fact that earlier designers of manholes did not provide for the subway transformers and the excessive heat of cables was cited as a cause for trouble now. When considering the transformer space in manholes to-day, an average of 4.5 cu. ft. (12.72 cu. dm.) per kva. seems to have generally worked out very satisfactorily. It was decided, however, that the larger the manhole can be made the more flexible will be its use.

F. W. Funk of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, opening a discussion on cable joints, stated that the joint in a cable when properly made is considerably stronger than any other point in the cable. In relatively heavy cables it is necessary to make a joint about every 500 ft. (152.4 meters) to facilitate the installation without introducing undue strain. Comparing the advantage of oil-filled joints and compound-filled joints, W. E. Richards of the Toledo Railways & Light Company pointed out that the oil-filled type can be refilled from time to time and is entirely free from voids. On the other hand, compound-filled joints contain voids in which loose particles become carbonized and in time cause breakdowns between conductors. Attention was also called to the fact that the characteristics of any joint depend on the personal element involved in making the joint.

M. E. Grah of the Toledo Railways & Light Company suggested that high-tension cables be placed in the lower ducts of a duct run in order that the heat-producing circuits (*i.e.*, the lower-voltage cables) may have the least effect on the high-tension cables. This location also provides an additional factor of safety from damage by workmen digging into the more dangerous and vital circuits.

M. H. Wagner of the Dayton Power & Light Company and F. M. Hibben of the Cleveland Electric Illuminating Company also spoke, discussing the question of safety precautions as applied to manholes.

January Earnings Reach $41,000,000

Results of Central Station Operation During First Month of Current Year Show Increase Over January, 1916, of 14.3 Per Cent in Earnings and 27.7 Per Cent in Output—Coal Shortage and Railroad Congestion Factors

FOR the first month of the present year the results from operations of electric light and power utilities in the United States, according to returns received by the ELECTRICAL WORLD, show very gratifying increases over the results obtained during the first months of 1916. In comparison with January, 1916, the January, 1917, earnings show an increase of 14.3 per cent and the output an increase of 27.7 per cent. Based on the returns received from about 55 per cent of the rated capacity of the central stations of the country, the earnings for January, 1917, were in round numbers $41,000,000. For the same months the output was 2,170,000,000 kw.-hr.

With the exception of the Atlantic States, all sections

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

	Percentage of Industry Represented	Income from the Sale of Energy			Kw.-Hr. Output		
		1916	1915	Per Cent Increase	1916	1915	Per Cent Increase
Feb.	65	22,133,000	19,175,000	15.3	1,121,452,000	869,537,000	29.1
March	65	22,027,000	18,722,000	17.8	1,212,363,000	969,888,000	25.2
April	64	21,206,000	18,375,000	15.5	1,137,602,000	920,464,000	23.1
May	64	20,345,000	17,559,000	16.0	1,170,143,000	944,681,000	24.0
June	64	20,254,000	17,551,000	15.4	1,170,679,000	968,724,000	21.0
July	64	19,760,000	17,301,000	14.2	1,174,374,000	976,704,000	24.4
Aug.	64	20,502,000	17,861,000	15.0	1,262,575,000	1,015,805,000	22.4
Sept.	64	21,432,000	18,600,000	15.2	1,268,339,000	1,037,976,000	21.2
Oct.	64	22,882,000	20,164,000	13.5	1,347,502,000	1,125,132,000	19.9
Nov.	64	24,819,000	21,744,000	14.4	1,396,537,000	1,148,221,000	21.7
Dec.	60	24,173,000	21,076,000	14.6	1,287,524,000	1,072,648,000	20.0
1917		1917	1916		1917	1916	
Jan.	55	22,587,000	19,742,000	14.3	1,194,183,000	935,812,000	27.7

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED BY SIZE

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
INCOME:										
Group 1	13.9	14.4	14.9	13.8	13.9	15.0	11.6	13.0	14.7	13.6
Group 2	17.0	17.5	17.7	16.8	15.7	20.4	19.2	17.7	16.9	16.3
Group 3	24.7	26.2	21.8	19.5	20.9	18.4	18.5	18.2	15.2	15.7
Group 4	17.4	15.1	11.0	9.0	9.5	11.3	13.5	12.8	12.3	15.4
Group 5	16.1	24.0	15.3	12.2	14.9	13.3	16.0	12.8	9.5	20.7
OUTPUT:										
Group 1	20.0	21.3	18.7	18.1	21.4	18.5	16.6	18.2	17.1	24.5
Group 2	25.5	18.0	17.5	22.9	33.0	32.9	31.1	27.2	21.9	28.6
Group 3	37.7	40.0	21.8	27.8	31.1	19.3	24.0	32.0	28.8	35.3
Group 4	22.7	23.0	19.3	16.1	23.0	26.0	20.4	19.7	21.0	30.5
Group 5	32.0	33.2	19.0	11.6	16.8	15.3	18.3	33.0	25.4	21.5

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
INCOME:										
Group 1	16.0	17.0	16.4	12.6	9.6	16.5	12.1	13.5	12.5	12.5
Group 2	21.2	19.5	19.8	20.6	15.1	25.5	21.3	20.0	30.2	16.1
Group 3	15.5	24.0	18.2	21.2	15.0	20.5	18.0	19.4	16.5	17.8
Group 4	13.2	13.5	7.2	6.2	11.1	10.5	15.4	16.0	16.0	22.0
Group 5	27.6	27.0	21.7	14.9	17.5	18.3	18.2	18.6	12.2	24.0
OUTPUT:										
Group 1	25.0	28.2	30.0	19.2	31.3	34.0	17.5	18.0	10.8	20.7
Group 2	31.4	33.2	26.3	14.1	32.0	37.7	35.0	24.7	18.2	24.8
Group 3	38.1	43.0	15.0	31.4	45.5	32.4	42.6	35.9	22.0	20.9
Group 4	36.1	30.0	21.0	26.6	39.4	32.9	48.9	40.0	55.2	73.8
Group 5	71.8	54.4	31.7	13.5	21.3	27.4	22.0	17.0	35.7	29.2

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States			Percentage of Industry Represented	Atlantic States			Percentage of Industry Represented	Central States (Illinois Excluded)			Percentage of Industry Represented	Pacific and Mountain States		
			1916	1915	Per Cent Increase		1916	1915	Per Cent Increase		1916	1915	Per Cent Increase		1916	1915	Per Cent Increase
INCOME	February	66	2,599,000	2,185,000	18.8	67	8,978,000	7,854,000	14.3	57	6,660,000	5,568,000	19.7	88	3,761,000	3,443,000	9.3
	March	66	2,595,000	2,122,000	22.0	67	8,998,000	7,660,000	17.5	57	6,470,000	5,394,000	20.1	88	3,787,000	3,386,000	11.9
	April	64	2,221,000	1,898,000	17.0	67	8,794,000	7,596,000	15.8	56	6,289,000	5,292,000	19.0	88	3,825,000	3,520,000	8.8
	May	65	2,103,000	1,788,000	17.0	67	8,226,000	7,131,000	15.4	56	6,085,000	5,123,000	18.7	88	3,874,000	3,469,000	11.6
	June	65	2,208,000	1,906,000	16.0	67	8,045,000	6,905,000	16.5	56	6,007,000	5,143,000	16.9	88	4,017,000	3,539,000	13.5
	July	65	2,130,000	1,875,000	13.7	67	7,832,000	6,621,000	16.4	56	5,926,000	5,095,000	16.3	88	3,755,000	3,493,000	7.6
	August	65	2,203,000	1,935,000	13.7	66	8,000,000	6,875,000	16.4	56	6,195,000	5,266,000	17.7	88	3,883,000	3,582,000	8.4
	September	65	2,315,000	1,982,000	16.8	66	8,631,000	7,445,000	16.0	56	6,505,000	5,537,000	17.8	88	3,979,000	3,644,000	9.2
	October	65	2,684,000	2,331,000	15.2	65	8,887,000	7,930,000	12.1	56	6,968,000	5,895,000	18.2	87	4,213,000	3,889,000	8.3
	November	65	2,912,000	2,516,000	15.7	65	10,061,000	8,859,000	13.5	56	7,410,000	6,313,000	17.4	87	4,246,000	3,947,000	7.5
	December	65	3,203,000	2,814,000	14.0	60	10,033,000	8,490,000	18.4	56	7,791,000	6,899,000	13.0	75	2,987,000	2,735,000	9.3
	1917		1917	1916			1917	1916			1917	1916			1917	1916	
	January	64	3,181,100	2,762,000	15.1	59	9,864,000	8,619,000	14.5	42	5,806,000	5,044,000	15.2	75	3,601,000	3,205,000	12.4
KW.-HR. OUTPUT			1916	1915			1916	1915			1916	1915			1916	1915	
	February	66	92,855,000	68,982,000	34.8	67	411,715,000	320,924,000	28.1	57	339,326,000	252,816,000	34.1	88	268,653,000	220,662,000	22.1
	March	66	97,321,000	74,958,000	29.9	67	439,660,000	349,347,000	26.0	57	360,872,000	282,179,000	28.0	88	304,327,000	255,450,000	19.3
	April	64	84,769,000	64,816,000	30.8	67	403,223,000	326,574,000	23.4	56	344,866,000	273,367,000	26.4	88	302,386,000	253,778,000	19.2
	May	65	84,719,000	64,318,000	31.8	67	409,529,000	333,585,000	22.0	56	345,860,000	275,328,000	25.6	88	328,793,000	266,599,000	23.2
	June	65	87,829,000	69,506,000	27.6	67	396,630,000	327,541,000	21.2	56	350,015,000	288,982,000	21.2	88	328,996,000	277,915,000	18.6
	July	65	85,317,000	71,160,000	19.8	67	401,179,000	333,771,000	20.3	56	350,708,000	287,407,000	22.2	88	325,647,000	279,285,000	17.4
	August	65	97,197,000	72,900,000	33.4	66	433,129,000	344,730,000	25.7	56	374,327,000	295,866,000	26.5	88	333,468,000	279,976,000	19.1
	September	65	98,350,000	73,343,000	34.2	66	446,534,000	369,815,000	20.8	56	387,626,000	307,485,000	26.2	88	335,817,000	288,332,000	16.4
	October	65	107,756,000	83,705,000	28.8	65	426,151,000	373,705,000	14.2	56	408,364,000	324,509,000	25.9	87	355,014,000	306,828,000	15.8
	November	65	111,873,000	89,015,000	25.7	65	533,252,000	424,746,000	25.6	56	415,491,000	334,044,000	24.4	87	346,847,000	293,518,000	18.2
	December	65	117,763,000	97,387,000	21.0	60	483,129,000	410,744,000	17.8	56	419,532,000	348,815,000	20.2	75	256,006,000	206,838,000	23.8
	1917		1917	1916			1917	1916			1917	1916			1917	1916	
	January	64	120,211,000	93,163,000	29.1	59	487,466,000	381,271,000	28.0	42	281,209,000	218,800,000	28.4	75	295,395,000	234,614,000	25.7

of the country show for January greater percentages of increase in earnings when compared with the same months of the previous year than in December. All sections, however, show a greater rate of growth for January than December so far as output is concerned. In fact, with the exception of February, 1916, the increase in output in January over January, 1916, was greater in per cent than in any previous month in the history of the industry."

The totals which are presented here represent strictly electric light and power operations. Earnings represent only that income received from the actual sale of energy, and do not in any case include merchandising sales or income derived from any other source. In like manner the output is merely that energy for which income is received. As far as possible all duplications are eliminated from these compilations.

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED BY SIZE

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
INCOME:										
Group 1.....	15.1	14.5	16.4	16.8	16.1	16.2	10.7	13.7	18.8	14.9
Group 2.....	81.5	21.7	21.9	18.5	21.6	19.0	21.0	22.5	21.7	13.4
Group 3.....	15.3	17.7	12.0	14.2	15.0	14.0	14.6	13.0	13.4	12.8
Group 4.....	19.5	14.0	15.4	10.0	14.4	9.8	13.5	13.1	14.4	13.5
Group 5.....	15.6	13.0	15.2	13.0	19.4	8.9	14.3	16.0	14.3	11.1
OUTPUT:										
Group 1.....	26.1	25.5	13.1	23.4	28.5	23.6	19.2	20.8	17.4	28.5
Group 2.....	35.6	11.3	31.8	27.4	32.5	26.7	33.0	31.9	28.2	28.3
Group 3.....	13.7	18.0	13.2	11.5	16.0	24.7	4.5	19.0	15.9	27.2
Group 4.....	19.0	12.6	19.7	16.3	29.5	18.6	17.5	14.6	16.0	24.8
Group 5.....	8.9	35.0	11.1	13.5	20.4	1.3	1.5	5.8	6.9	9.4

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED BY SIZE

	April	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.	Jan.
INCOME:										
Group 1.....	18.2	18.0	16.4	15.8	16.5	16.6	18.0	16.5	13.0	14.3
Group 2.....	18.0	17.4	17.5	17.3	21.8	21.5	21.0	17.0	16.4	18.8
Group 3.....	26.7	27.2	20.5	18.6	18.4	13.4	10.9	13.0	1.8	5.5
Group 4.....	22.8	24.1	17.5	17.5	10.7	20.0	19.7	16.8	15.5	19.8
Group 5.....	9.4	21.3	12.6	6.1	11.8	11.0	18.4	14.3	†....	19.3
OUTPUT:										
Group 1.....	24.7	25.0	23.8	21.0	24.3	22.3	24.9	24.8	22.3	31.6
Group 2.....	23.9	19.5	12.3	25.7	36.4	40.0	31.7	29.7	21.0	31.5
Group 3.....	43.5	41.0	31.8	26.0	25.7	20.7	17.3	19.7	1.2	6.4
Group 4.....	39.2	38.5	34.3	21.1	23.0	33.8	26.1	21.2	21.4	24.5
Group 5.....	10.1	14.7	4.0	8.6	6.1	13.7	28.2	16.8	9.9	15.5

†Results omitted owing to insufficient returns.

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
INCOME:										
Group 1.....	3.9	7.2	7.5	4.7	5.5	6.2	4.2	4.5	4.0	8.6
Group 2.....	3.5*	2.3	1.2	0.6*	0.7	4.9	1.3	3.0	3.6	7.5
Group 3.....	40.0	39.0	39.5	28.3	32.5	28.5	32.4	31.0	30.0	27.6
Group 4.....	11.7	13.8	3.6	1.0	0.5	11.5	7.2	0.4	0.6*	8.6
Group 5.....	12.0	19.1	12.8*	13.2	13.0	11.7	13.5	17.1	11.1	20.0
OUTPUT:										
Group 1.....	8.0	12.0	8.0	10.0	6.3	7.1	5.2	8.0	8.6	14.0
Group 2.....	3.6*	2.2	1.0	2.0	6.5	7.8	9.7	11.4	8.7	11.8
Group 3.....	80.0	79.0	74.5	56.1	57.5	60.0	63.7	61.3	48.0	59.5
Group 4.....	10.3	21.8	10.0	4.0	7.5	12.0	*0.5	4.2	2.6	15.2
Group 5.....	11.7	17.5	16.0	10.8	16.5	7.0	14.7	42.3	5.4	15.6

*Decrease.

The effect of the tremendous sale of motors to industrial establishments is readily seen from the tremendous growth in output over the previous year. Motors ordered many months ago are now finding their way onto the lines of the central stations. Furthermore, motors of a very great total rating are still in the process of manufacture.

The increased rate of growth shown by the January returns serves to indicate in a measure to what extent central stations were called upon to supply industrial establishments owing to the high price of coal and the inability in some sections of the country to obtain any. There is no doubt that the coal shortage was responsible for many isolated plants taking central station service—

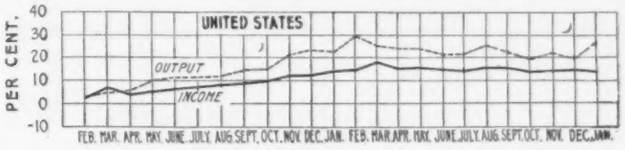
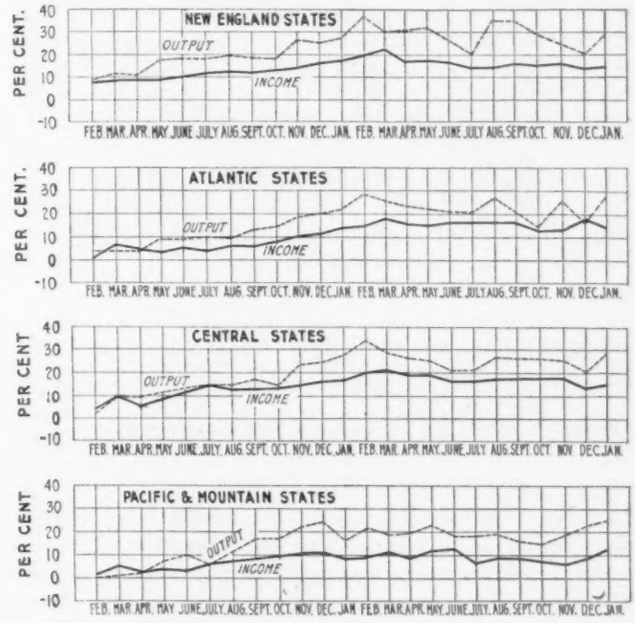


FIG. 1—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT FOR UNITED STATES

plants that in many instances were economically and efficiently operated before fuel difficulties arose. To a certain extent, however, the January operations were curtailed owing to weather conditions, railroad congestion and embargo and insufficient supply of raw material and labor. During January industrial operations were cut down to a considerable extent by these factors. In addition there was a certain falling off due to the winding up of a large number of big munition contracts in different sections of the country.

Earnings did not present any such acceleration in the rate of growth, owing in large measure to decreases in rates which went into effect at the beginning of the new year.

The accompanying curves show graphically the rate of increase both in income and output in per cent as contained in Tables I and II. The remaining tables show the percentages of increase in income and output by companies, grouped according to the size of the com-



FIGS. 2 TO 5—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT SECTIONALLY

munity served. Group 1 represents those companies operating in cities of 100,000 inhabitants and over; group 2 those companies operating in cities having a population between 50,000 and 100,000; group 3 in cities between 25,000 and 50,000; group 4 in cities between 10,000 and 25,000, and group 5 in cities between 5000 and 10,000.

STATION AND OPERATING PRACTICE

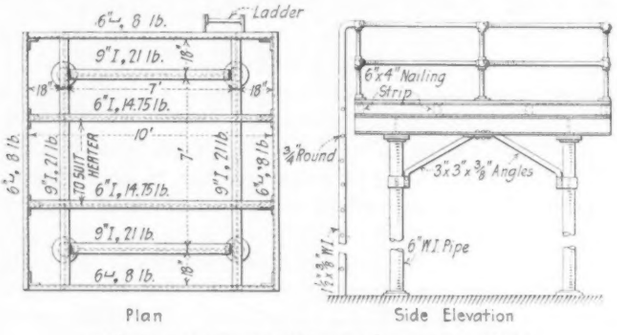
A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

PLATFORM BUILT FOR FEED-WATER HEATERS

Designed to Conserve Floor Space and Provide Ample Room Around Heater for Inspection and Operation

BY T. W. REYNOLDS

A feed water heater platform designed so as to conserve floor space and provide ample room around the feed water heater for inspection, operation and repairs is shown herewith. Access is afforded thereto by



DETAILS OF FEED-WATER HEATER PLATFORM

means of a permanent iron ladder. For the protection of station attendants a pipe railing is installed around the entire platform. Six-in. I beams transfer the weight of the heater to the platform columns, which are made of 6-in. wrought-iron pipe. These may be of any height required for clearance or to produce the proper static head upon the suction of the boiler-feed pumps. The columns should be anchor-bolted to concrete foundations. The outer edges of the platform are formed by 6-in. 8-lb. channel irons, on which are laid 4-in. by 1½-in. boards for flooring.

EMERGENCY OUTFIT FOR STREET-LIGHTING CREWS

Arrangement for Providing Emergency Men with Electrical Repair Supplies in the Shortest Possible Time

In order to minimize the time required for assembling an outfit to remove any cause of trouble on its street-lighting system, the electrical department of Lincoln Park, Chicago, has arranged an emergency board, which is placed in the company's main substation, from which emergency crews are dispatched. The board carries the following materials:

Triple-braided cable, block and tackle, rope slings, pike pole, water wrenches, man-power manhole pump, linemen's climbers and safety belt, handsaw, hacksaw, rubber tape, friction tape, linen tape, sledge hammer, pick, two shovels, axe, pipe cutter, monkey wrench, pipe wrench, water plug keys, ball peen hammer, long and short cold chisel, "come-alongs," bull point and tongs, crowbar, globes and lamps, pot-head jumpers, manhole ladders, and three emergency fixtures for isle of safety lighting.

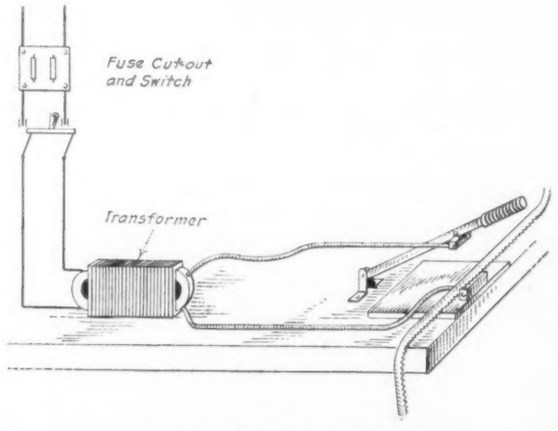
Each piece of this equipment is painted red so that it will not become mixed with the regular assortment of tools and material. The emergency fixtures for the isle of safety lighting are wired and ready to set up in place of a wrecked standard, the connection to the circuit being made through a standard plug-type receptacle, which is a part of the equipment.

WELDER FOR REPAIR WORK

Apparatus Made by Replacing Secondary Winding of 1-Kw. Transformer with Few Turns of Heavier Wire

BY H. S. RICH

Small repair work may be easily performed with the practical welder shown in the accompanying illustration, which is made by rebuilding a 1-kw., 220-volt transformer. The secondary winding was removed and replaced by one wound with three or four turns of about No. 4 stranded slow-burning wire so as to deliver from 30 to 40 amp. at 5 to 10 volts. A 25-amp. knife switch fused for 15 amp. is used on the primary line. The secondary flexible leads should be carried to the welding vise, as shown in the illustration, where they are tipped with large copper lugs and securely screwed to two copper blocks about 2 in. long by 1 in. square on the ends. By connecting directly to the copper electrodes the voltage is not lowered by resistance. Large elec-



METHOD OF REPAIRING A BROKEN SAW

trodes are used so that the heat of the welding arc will not damage them.

The lower electrode is screwed to the bench, which is first covered with 1 sq. ft. of ⅛-in. asbestos board. The upper electrode is bolted to a flat iron bar 18 in. long, 1 in. wide and 0.25 in. thick. A wooden handle is riveted one-half to each side, and then covered with two or three layers of friction tape. The object to be welded

as well as a piece of hard silver solder must be in place before closing the secondary circuit. The joint to be welded is placed on the lower electrode and the lever carrying the upper electrode lowered. The circuit should be kept closed only a few seconds with a heavy hand pressure on the lever. After opening the circuit, the joint should be filed and cleaned.

BASIS FOR FEEDER SIZES

Relation Between Demand and Connected Load as Basis for Determining Size of Conductor

BY G. SOUTHERN
Engineer for Mills, Rhines, Bellman & Nordhoff, Toledo, Ohio

In determining the sizes of feeders for building and industrial wiring systems a proper consideration should first be given to the question of whether or not an increase in the load is likely to be made after the feeder system is installed. It is better economy to install feeders of adequate size at first than to have to increase the cross-section later. Naturally, there are many classes of installation where the actual demand is considerably less than the connected load, which permits reducing the size of the feeders. The ratio of the demand to the connected load varies in every case and is governed to a very great extent by the nature of the load.

For instance, in a building where three or more passenger elevators are operated in a group, the entire demand will not exceed 70 per cent of the connected load for the main feeders. This is due to the fact that at no time will all the elevators be started simultaneously in one direction. Actual tests on a direct-current elevator installation showed a pumping back of current amounting to from 30 per cent to 50 per cent of the connected load. In such a case there is no reason why feeders should be installed larger than the load requires.

Similar conditions are found in most industrial power installations, particularly where groups of machines are operated from line shafting and where several motors are used to furnish the necessary power. In many cases several machines will be idle at all times, due to operattions in setting up, changing over, making adjustments, etc. This in turn will lessen the demand over the entire equipment. The actual demand load under such conditions can only be determined by testing.

Many lighting installations also are of such a nature that the demand is less than the connected load. In office buildings where the entire space above the first floor is used for offices only, the demand will be about 80 per cent, but the sizes of feeders for the first floor of such a building should, in general, be determined according to the connected load. In residences with a connected load of 8 kw. and over the demand will be about 75 per cent.

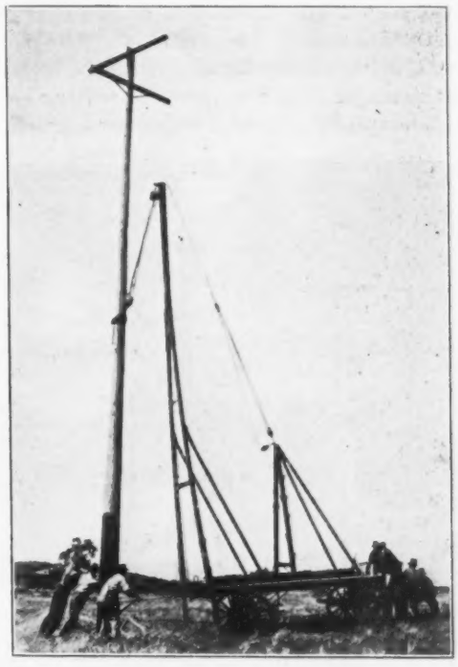
The selection of the size of conductors to supply various installations should always be consistent but not excessive. The factor of safety should be sufficient to provide the necessary protection. In many cases the cost of the installation is so high that the engineer is unable to specify any safety devices that are not required by the National Electrical Code. Where sizes of feeders are determined according to the demand, it should be generally recommended that they be protected with circuit breakers or similar devices. This will prevent abuses that might otherwise arise.

RAPID ERECTION OF POLES

How 50-Ft. Cedar Poles Have Been Erected in an Average Time of Twelve Minutes per Pole

By the use of equipment which is partly home-made, the San Diego (Cal.) Consolidated Gas & Electric Company has been able to raise poles on three transmission lines in an average time of twelve minutes per pole. One line consisted of an 18-mile (28.97 km.) stretch of 66,000-volt circuit, and the other two were 11,000-volt circuits, 12 miles (19.31 km.) and 16 miles (25.75 km.) long respectively. Most of the poles were 50-ft. (15.24 m.) Western red cedar, with not less than 9-in. (22.86-cm.) tops and an average weight of 1600 lb. (725.7 kg.) each. In some places 55-ft. (16.76-m.) and 60-ft. (18.29-m.) poles were used. All of the lines stretch across rough, brush-covered country.

The equipment which was used consisted of a Matthews pole erector with an extension built on the peak



DROPPING A 1600-LB. POLE INTO ITS HOLE WITH LESS THAN THIRTEEN MINUTES' WORK

of the gin, as shown in the accompanying illustration. It was found necessary to increase the effective height of the gin because of the 55-ft. (16.76-m.) and 60-ft. (18.29-m.) poles, which had to be raised occasionally, and because, in rough country, it is not always possible to place the bed of the pole-erector wagon on a level site and thus obtain the advantage of the full normal height of the gin. At first the increased height was obtained by putting a channel-iron extension on the peak of the gin. Later, when this extension was bent, it was replaced by another made from two pieces of Douglas fir measuring 3.75 in. by 5.75 in. by 10 ft. (9.53 cm. by 14.6 cm. by 3.04 m.).

Experience with this outfit has shown that it is advisable to haul the pole-erector wagon with a team and to use an automobile truck for pulling the rope. Where the earth is soft the wagon has to be blocked up so that the feet of the erector will have a solid bearing. In speaking of the use of this apparatus under severe conditions in rough country, L. M. Klauber,

superintendent of the electrical department for the San Diego company, pointed out that even on the first day this outfit was used the line crew required an average of only thirteen minutes from pole to pole, including the time consumed in setting the erector and in traveling from hole to hole. The pole spacing was 350 ft.

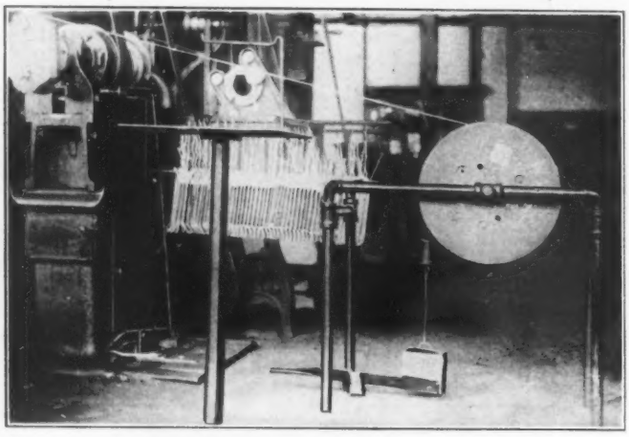
COIL-WINDING MACHINE MADE FROM TURRET LATHE

Home-Made Outfit Reduces Expense of Winding Coils, and the Buying of New Apparatus Is Avoided

BY J. S. MILLS

Foreman Electrical Department, Morris Park Shops, Long Island Railroad

About a year ago it became necessary to rewind a great many old compressor armatures. This meant obtaining a coil-winding machine or using more help to wind the coils by hand. Instead of purchasing new apparatus, an old Jones & Lamson 2-in. (5.08-cm.) bar, friction-head-drive turret lathe too badly worn to be used in the machine shop was put in operating condition and used successfully as a coil-winding machine.



HOME-MADE COIL-WINDING OUTFIT

The lathe bed was cut off flush with the pulley-cone bearing so that any form on which a coil is to be wound can be fastened to the face of the spindle and driven without striking any part of the lathe. The three-cone pulley and the friction drive in the lathe head permit a range of six speeds. To provide a means of starting and stopping the machine by a foot control so that the operator can use both hands for guiding the wire, etc., the original operating handle of the friction drive was removed, and in its place a connecting rod, lever and foot pedal was arranged as shown in the illustration, so that when the operator's foot is removed from the pedal a spring instantly brings the lever to the off position.

To assist the operator to feed the wire, the reel is mounted on a stand of 1-in. (2.54-cm.) iron pipe. This is equipped with a tension device consisting of a piece of band wire fastened to the back cross pipe of the stand and passing along a groove in the circumference of the end of the reel. Two weights are attached to the wire as shown. The large weight is fastened to a lever so that the pressure of the operator's foot releases the tension in the band wire, which in turn releases the tension on the wire which is being unreeled. The smaller weight, which is 4 lb. (1.81 kg.) keeps the band wire from coming out of the groove in the edge of the reel when the large weight is raised. One feature of this tension device is the fact that friction is applied to the circumference of the reel and not to the cotton-covered wire itself, thus injury to the insulation is avoided. At the same time the tension is easily controlled by the foot.

Short pieces of cotton sleeving are used for additional insulation on the free ends of the coil. It is necessary to slip these sleeves over the wire before winding the coil as they have to be glued under the fish paper which holds the coil in shape after being taken off the form. One of these sleeves is used when the coil is started while the other is slid along the wire to the other end. Considerable time was consumd in threading the ends of the wire into the sleeves as the insulation backed away from the ends and became jammed in the sleeving. This is remedied by dipping the end of the wire in melted paraffin and pulling the insulation past the end of the conductor and twisting it. This made it easy to slip on the cotton sleeve.

This coil-winding machine with the simple reeling device and the use of paraffin in putting on the cotton sleeves has cut the expense of winding coils in our shops in half.

OPERATING COSTS FOR TRUCKS

Data Compiled by a Western Company Taking Into Account Depreciation and Interest

The Lincoln (Neb.) Telephone & Telegraph Company has made the following comparisons in the costs of operating automobile trucks and employing teams to transport its men. The cost of operating a Buick 0.75-ton truck from July 13, 1914, to Jan. 31, 1916, including the wages and expenses of driver, oil, gas and tires, was $1 per day for depreciation, and the expenses amounted to $2,343.48. This expense may be divided as follows: Cost of operating truck, $1,688.48; depreciation, $562; interest on investment, $93; or an average of $6.16 per day for the 381 days the truck was actually used.

The cost of employing teams to transport the men on this work would have been approximately $2,300, as the total cost per day of a team varies from $5.80 to $6.28. The increased speed of the truck, which was regulated to a maximum of 22 m.p.h. (3.54 km.p.h.), made it possible to save an average of slightly more than two hours per day of the time of each man (an average of slightly more than eight hours) in the gang, which, including overhead charges, amounted to $2,288.38. It was also possible, between necessary trips with the men, to deliver material on which extra team transportation charges would have amounted to $298.05, making a total earning for the truck of $2,576.43, or a total net saving of $1,946.85, or more than 150 per cent of the cost of the truck.

Method of Replacing Steam Trap

By T. W. Reynolds

Where the expense of a steam trap for receiving condensate which can be thrown away is prohibitive, it is recommended that the discharge pipe be extended outside the building and its open end buried a few inches below the surface of the ground. The resistance of the earth will be sufficient to prevent the free passage of steam into the atmosphere and yet afford ample drainage.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

EDUCATION IN USE OF ELECTRIC COOKING GROWS

Electric Luncheon Given to Indiana Authors Results in Immediate Free Publicity for Electric Labor-Saving Devices

When the Indiana Woman's Press Club, comprising about sixty-five Hoosier women who earn their living by writing for papers and periodicals, held its March meeting at Indianapolis a feature of the day was an electrically cooked luncheon served hot from an electric range by the Merchants' Heat & Light Company. Forty-two feminine members of the press were present, and after the luncheon L. G. Rothchild of the lighting company made a short talk on electric cooking.

Tangible results of that little educational effort have already begun to come to light in the shape of newspaper articles on electric cooking written by women. For instance, a March issue of the *Carroll County Citizens-Times*, Delphi, Ind., carried a five-column story by Mindwell Crampton Wilson—a woman known in her community as a graduate of Purdue University, an author and the president of the Indiana Woman's Press Club. The article not only extols the wonders of electric cooking, but also points to electricity as the universal servant. It provides an excellent example, the representatives of the Merchants' company believe, of the ease with which effective and wide circulation can be given to information on electric cooking in the present day of its popularity.

TAKING SERVICE TO THE CUSTOMER'S FRONT DOOR

How a Central-Station Company with a Large Number of Both Electric and Gas Properties Called on 23,202 Customers

BY E. E. SOULES

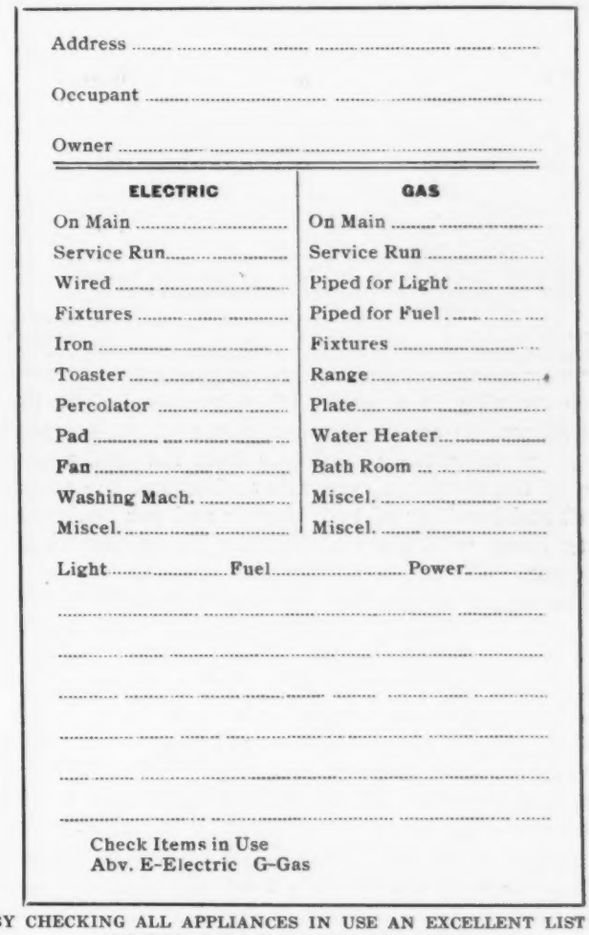
Basing its action on the theory that a contented customer is a direct asset to a company, the Illinois Traction Company has adopted a new plan whereby instead of waiting for its patrons to ask for "service" it takes service to their front doors. Instead of waiting for troubles, it anticipates them and heads them off before they have time to develop. This service is rendered without cost to customers.

The Illinois Traction Company operates seven electric and thirteen combination gas and electric central stations serving sixty-six cities with gas or electricity in the States of Illinois, Iowa, Missouri and Kansas. Each of these plants has its own organization with general superintendent, who reports to the office of the vice-president executive in Peoria, Ill.

Realizing that a local property of moderate size is necessarily handicapped in the giving of "service" in addition to actual supplying of gas and electricity because of the small organization, H. E. Chubbuck, vice-president executive, evolved the idea of organizing a "service crew," composed of experts in the handling of gas and electric equipment, and sending them from one property to another. The plan was placed in operation July 15, 1916, and the crew was placed in charge of the manager of the commercial department, with headquarters in Peoria.

This crew consists of six expert service men in charge of a supervisor. Ordinarily the crew remains in a city from three to five weeks, this depending upon the size of the city and the number of patrons of the local property. Their arrival and the purpose for which they are sent to the local property are announced about a week prior to their coming in a half-page advertisement in the newspapers. During their stay in the city the company carries in all newspapers at least three liberal display advertisements each week bearing on the campaign and the progress being made. This copy is prepared in the office of the publicity department.

In introducing the service crew the advertisements make clear the fact that the representatives will call on each gas and electric customer in the city. The ad-


Address .....

Occupant .....

Owner .....

ELECTRIC	GAS
On Main	On Main .....
Service Run	Service Run .....
Wired	Piped for Light .....
Fixtures	Piped for Fuel .....
Iron	Fixtures .....
Toaster	Range .....
Percolator	Plate .....
Pad	Water Heater .....
Fan	Bath Room .....
Washing Mach.	Miscel. .....
Miscel.	Miscel. .....

Light ..... Fuel ..... Power .....

Check Items in Use
Abv. E-Electric G-Gas

BY CHECKING ALL APPLIANCES IN USE AN EXCELLENT LIST IS OBTAINED FOR SOLICITING NEW BUSINESS

vertisements also urge customers who have complaints to make in regard to any equipment to "save up their troubles and tell them to the man with the badge." It is made plain that these representatives will be designated either by a badge or a credential card, and that they are at the service of customers without charge. Besides, it is explained that they have nothing to sell and that they are not demonstrators. Their object, as stated in this advertising, is to assist the customer in bringing his electric and gas equipment up to a high state of efficiency. It is announced that the men will replace broken sockets, repair flatirons where possible, adjust gas stoves, clean gas burners, and, in short, make a thorough inspection of the electric or gas equipment.

The men attached to the service crew are given thor-

RESULTS OF SIX MONTHS' WORK OF SERVICE CREW

Service to Customers				Prospective Customers	
Electric Repairs		Gas Repairs		Electric	Gas
Irons repaired	191	Burners adjusted	2,881	460	396
Iron cords repaired	227	Burners cleaned	2,768		
Lamp cords furnished	123	Burners cemented	665		
Lamp cords repaired	179	Fixtures tightened	269		
Fuses	348	Handles tightened	999		
Switches furnished	510	Irons adjusted	79		
Switches repaired	167	Leaks fixed	637		
Sockets repaired	434	Lights adjusted	743		
Sockets replaced (snap)	820	Pillars and tips furnished	198		
Sockets replaced (chain)	134	Valves adjusted	1,775		
Attachment plugs replaced	186	Valves cleaned	1,610		
Attachment plugs repaired	96				
Wall sockets replaced	47				
Totals	4,326		12,124	460	396
Grand total			16,450		856

ough training in a school of instruction before they are allowed to act as representatives of the company. They are ordinarily picked men from the local properties of the company, men who understand the adjustment and handling of both electric and gas equipment. They carry with them a complete kit containing the necessary tools and parts for small repairs.

The supervisor precedes the service crew by a week, acting in the capacity of "advance man." The method of operation in this respect is very similar to that of a theatrical organization. In addition to securing quarters for the men and arranging with the local superintendent and newspapers for the preliminary advertising, the supervisor makes a preliminary survey of the city. A map is drawn up and the city to be covered is divided into territories, which are assigned to various members of the crew. By the time the crew arrives all preliminary arrangements have been made and no time is lost.

In addition to the service rendered to the customers the men also turn into the company's office data cards which give in brief the entire electric or gas "layout" in each house or place of business called upon. The men are also instructed to be on the lookout for prospective customers for both electric and gas appliances and service, and as a result the local company has a thorough electric and gas survey of the city when the crew has finished its work.

The Results of the Plan Are Encouraging

It is the experience of the company that, while the maintenance of the service crew is costly, the advantages resulting more than offset the expense. Not only do customers appreciate the service rendered, but the innovation has invariably been commented upon most favorably by the press both in its news columns and editorially. During the six months that this service crew has been in operation it has "covered" six cities ranging in population from 7000 to 28,000. In these six cities, with a total population of about 110,000 people, the crew called on 23,202 utility service customers. On the premises of these customers they found 16,450 jobs they could do to make service better. Of these jobs 4326 were electric and 12,124 gas. This means that probably more than one-half of the customers called on had something that needed fixing; something was out of service and was returning no revenue merely because it needed repair. Some patrons had more than one source of trouble. It is true that most of the repairs were small ones. Most of them the owner could have repaired himself, but owners, it has been found, generally will not make these repairs until after actual trouble results. So the Illinois Traction Company, taking the initiative, did this work gratuitously for the customers. And as its return it has received increasing good will and 856 prospective customers, 460 for electric and 396 for gas appliances and service.

CHART FOR REDUCING THE COST OF BILLING

Kansas Company Uses Scheme Adaptable to Small Utilities Whereby 50 Per Cent of Billing Time Is Conserved

A large amount of tiresome work in office routine is necessary during the billing days of each month. The operation furthermore is a costly one. To reduce the

BILLING CHART TO BE USED WITH BLOCK RATE

0	0	1	2	3	4	5	6	7	8	9
10	$1.00	$1.10	$1.20	$1.30	$1.40	$1.50	$1.60	$1.70	$1.80	$1.90
20	2.00	2.09	2.18	2.27	2.36	2.45	2.54	2.63	2.72	2.81
30	2.90	2.99	3.08	3.17	3.26	3.35	3.44	3.53	3.62	3.71
40	3.80	3.88	3.96	4.04	4.12	4.20	4.28	4.36	4.44	4.52
50	4.60	4.68	4.76	4.84	4.92	5.00	5.08	5.16	5.24	5.32
60	5.40	5.47	5.54	5.61	5.68	5.75	5.82	5.89	5.96	6.03
70	6.10	6.17	6.24	6.31	6.38	6.45	6.52	6.59	6.66	6.73
80	6.80	6.86	6.92	6.98	7.04	7.10	7.16	7.22	7.28	7.34
90	7.40	7.46	7.52	7.58	7.64	7.70	7.76	7.82	7.88	7.94
100	8.00	8.06	8.12	8.18	8.24	8.30	8.36	8.42	8.48	8.54
110	8.60	8.66	8.72	8.78	8.84	8.90	8.96	9.02	9.08	9.14
120	9.20	9.26	9.32	9.38	9.44	9.50	9.56	9.62	9.68	9.74
130	9.80	9.86	9.92	9.98	10.04	10.10	10.16	10.22	10.28	10.34
140	10.40	10.46	10.52	10.58	10.64	10.70	10.76	10.82	10.88	10.94
150	11.00	11.06	11.12	11.18	11.24	11.30	11.36	11.42	11.48	11.54
160	11.60	11.66	11.72	11.78	11.84	11.90	11.96	12.02	12.08	12.14
170	12.20	12.26	12.32	12.38	12.44	12.50	12.56	12.62	12.68	12.74
180	12.80	12.86	12.92	12.98	13.04	13.10	13.16	13.22	13.28	13.34
190	13.40	13.46	13.52	13.58	13.64	13.70	13.76	13.82	13.88	13.94
200	14.00	14.06	14.12	14.18	14.24	14.30	14.36	13.42	13.48	13.54
210	14.60	14.66	14.72	14.78	14.84	14.90	14.96	15.02	15.08	15.14
220	15.20	15.26	15.32	15.38	15.44	15.50	15.56	15.62	15.68	15.74
230	15.80	15.86	15.92	15.98	16.04	16.10	16.16	16.22	16.28	16.34
240	16.40	16.46	16.52	16.58	16.64	16.70	16.76	16.82	16.88	16.94
250	17.00	17.06	17.12	17.18	17.24	17.30	17.36	17.42	17.48	17.54
260	17.60	17.66	17.72	17.78	17.84	17.90	17.96	18.02	18.08	18.14
270	18.20	18.26	18.32	18.38	18.44	18.50	18.56	18.62	18.68	18.74
280	18.80	18.86	18.92	18.98	19.04	19.10	19.16	19.22	19.28	19.34
290	19.40	19.46	19.52	19.58	19.64	19.70	19.76	19.82	19.88	19.94
300	20.00	20.06	20.12	20.18	20.24	20.30	20.36	20.42	20.48	20.54
310	20.60	20.66	20.72	20.78	20.84	20.90	20.96	21.02	21.08	21.14
320	21.20	21.26	21.32	21.38	21.44	21.50	21.56	21.62	21.68	21.74
330	21.80	21.86	21.92	21.98	22.04	22.10	22.16	22.22	22.28	22.34
340	22.40	22.46	22.52	22.58	22.64	22.70	22.76	22.82	22.88	22.94
350	23.00	23.06	23.12	23.18	23.24	23.30	23.36	23.42	23.48	23.54
360	23.60	23.66	23.72	23.78	23.84	23.90	23.96	24.02	24.08	24.14
370	24.20	24.26	24.32	24.38	24.44	24.50	24.56	24.62	24.68	24.74
380	24.80	24.86	24.92	24.98	25.04	25.10	25.16	25.22	25.28	25.34
390	25.40	25.46	25.52	25.58	25.64	25.70	25.76	25.82	25.88	25.94
400	26.00									

cost of such work a billing chart, particularly adaptable to small companies, has been worked out by H. H. Fenton, superintendent of distribution of the Marshall

County Power & Light Company, Blue Rapids, Kan., for use by his company.

It is found that the time of billing, so far as deriving the amount of the bill is concerned, can be cut 50 per cent by the chart. A test was made to obtain the time required to calculate the various amounts of the bills, and then a comparative time test was made using the chart. An average of ten seconds was required to calculate, while only five seconds was consumed by use of the chart. Also, the list of consumers used was the lesser ones, which means less time required to calculate than would have been necessary with the larger consumptions.

In the left-hand column of the chart as shown here are tabulated the amounts of consumption by tens, while the intermediate values are found in the respective succeeding columns. The operation is thus: The bill for a consumption of 42 kw.-hr. is found by sliding the finger down to 40 and thence to the right to the column headed "2," reading $3.96. Similarly, the bill for a consumption of 118 kw.-hr. is found in column "8" opposite 110, reading $8.48. The cause for the particular figures on this chart is a block-rate system of charging for energy used, as follows: First 20 kw.-hr., 10 cents; second 20 kw.-hr., 9 cents; third 20 kw.-hr., 8 cents; fourth 20 kw.-hr., 7 cents; all over 80 kw.-hr., 6 cents.

Small companies having block rates can easily adapt this scheme to their own use by changing the figures in the chart so that they will correspond to their respective rates, whatever these may be.

CHANGING FROM DIRECT TO ALTERNATING CURRENT

Some Plans for Handling Customers' Equipment That Have Been Successfully Employed by Ohio Central Stations

When the electric service for a small town or a section of a large city is to be changed from direct to alternating current, the manager in charge of the property faces the problem of getting changes made in each customer's equipment on a basis satisfactory alike to the customer and the company. A discussion of ways and means of conducting such a change in a recent Ohio central station committee meeting brought out the following ideas:

The Toledo Railways & Light Company places the entire job in the hands of one man selected from the sales department. He becomes acquainted with all of the customers who will be affected by the change. Then he makes bargains separately with each one, endeavoring to get the equipment changed with as little expense to the company as possible. Sometimes he is very successful; sometimes he is forced to spend considerable money.

Another company reported that it had tried this same plan with the additional provision that a cost bogie was set and the man in charge received a percentage of the difference between this bogie and the lesser cost of the change if he made the change in less than bogie. This supplied an incentive for the company's representative, but he was not always able to make the bogie that had been set.

The Ohio Light & Power Company has found it expedient in most changes of this kind to take the direct-current equipment and sell alternating-current apparatus to replace it at very low prices. It reports little trouble with this plan. Another company interests a reputable second-hand dealer in electrical machinery in the proposition and gives him a free hand in dealing with the customers. This plan was tried several times with success, the W. G. Nagle Electric Company of Toledo acting as the second-hand firm. In closing the discussion one central station engineer advised investigating the possibilities of serving the direct-current load with a synchronous motor-generator set before deciding to go ahead with the change.

COMMISSION PAID EMPLOYEES ON APPLIANCE PROSPECTS

St. Louis Company Inaugurates System with Commissions Ranging from $2 on Ranges to 10 Cents on Small Appliances

That employees are in the possession of or in a position to obtain information of value to the new-business department of any central station company, especially the names of prospective purchasers of appliances, is undoubtedly true. It is equally true that this information will seldom get to the commercial department unless "the ways are greased" either by commissions, bonuses or some other tangible means.

The commission plan for the sale of appliances through employees has been adopted by the Union Electric Light & Power Company, St. Louis. Employees knowing of people who are contemplating buying an electric range or other electric appliances are required to fill in a special form, reproduced herewith, and file it with the chief clerk of the commercial department. It will then be checked and, provided that it is not already of record and being worked on by some one else, will be placed to the credit of the employee furnishing the lead. The lead is followed promptly, and if the sale is made within fifteen days the employee turning in the lead receives a commission thereon. The commissions are as follows: Electric range, $2; electric washing machine, $1; electric vacuum cleaner, 50 cents; on all other appliances, 10 cents. The range commission will not be paid until the forty-five day guarantee period expires and the range sale becomes permanent.

Form 271. APPLIANCE LEAD

Interested in Appliances checked	
Electric Range	
Electric Grill	
Electric Toaster	
Electric Fan	
Electric Percolator	
Household Iron	
Tailors Iron	
Vacuum Cleaner	
Washing Machine	
Sewing Machine Motor	

Name.....

Address.....

Remarks.....

.....

.....

.....

From.....Date.....

Department.....

Appliance department, please return to sales department with report on back hereof if sale is made.

EMPLOYEES IN ORDER TO OBTAIN COMMISSIONS MUST FILL OUT A BLANK FORM LIKE THIS AND THEN FILE IT WITH COMMERCIAL DEPARTMENT

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

WINDING SYSTEMS IN MINES

Comparison Between Electric and Steam Winding Systems and Between Direct-Current and Three-Phase Systems for Hoisting in South African Mines

At a meeting of the South African Institute of Electrical Engineers held at Johannesburg on Dec. 21, 1916, two interesting papers on winding systems in South African mines were presented by Harold W. Clayden and S. E. T. Ewing respectively. Both papers are printed in the December, 1916, issue of the *Transactions* of the South African Institute of Electrical Engineers.

Mr. Ewing compares the Ward-Leonard system and the three-phase winding system with respect to the different requirements of mine hoisting, and reaches the following conclusions:

For shaft sinking both systems are equally effective on all points at approximately equal capital cost.

For rock winding from one level with tail ropes the relative economy of the two systems depends on the frequency of winding; the lower the frequency of winding the greater the gain to the alternating-current system, and conversely the higher the frequency the greater the gain to the Ward-Leonard system. The alternating-current system has the lower capital cost. The systems are of equal safety and ease of handling.

For rock winding from one level without tail ropes the alternating-current system has lower capital cost, while the Ward-Leonard system has superior over-all economy and is easier to handle.

For rock winding from several levels, for raising and lowering men, for lowering supplies, and for dead-slow winding the alternating-current system has lower capital cost, while the Ward-Leonard system has the superior over-all economy and is easier to handle.

The paper by Harold W. Clayden gives comparative efficiency and cost figures from practice for three winding plants—a 5-ton (4.5 metric ton) Ward-Leonard winder, a 5-ton (4.5 metric ton) three-phase winder, and a 4-ton (3.6 metric ton) steam winder at three different mines. The horsepower is 500 for the Ward-Leonard winder, 550 for the three-phase winder and 800 for the steam winder; the size of drums is 10 ft. by 3 ft. 6 in. (3.05 by 1.06 meters), 10 ft. by 3 ft. 6 in. (3.05 by 1.06 meters), 9 ft. by 3 ft. 3 in. (2.74 by 0.95 meters); the maximum rope speed 2000 ft. (609 meters), 1500 ft. (457 meters), 1500 ft. (457 meters); the capacity of the skip, 5, 5, 4 tons (4.5, 4.5, 3.6 metric tons); the maximum vertical depth of wind 2060 ft. (627 meters), 1583 ft. (483 meters), 1323 ft. (403 meters); the maximum length of wind 3902 ft., (1189 meters), 2420 ft. (738 meters), 2072 ft. (632 meters). These figures are near enough to give a fair comparison.

Diagrams are given in the paper showing curves of the shaft horsepower-hours, the kilowatt-hours, the load factor and the over-all efficiency. From these curves it appears that the Ward-Leonard winder has a 6.7 per cent higher over-all efficiency than the three-phase winder; but in the case of the former only two shifts are worked and the converter set is shut down for seven hours each day. This set requires 20 kw.-hr. per hour running light, so that comparing the two winders on a twenty-four-hour service the Ward-Leonard efficiency will be only 3.5 per cent better than the three-phase winder.

The steam winder was started in September, 1915, but up to March, 1916, a temporary electrical plant was supplied by the same boiler plant, therefore only three months' accurate figures as to steam consumption are available. For the three months ended June, 1916, this winder required 99 lb. (45.6 kg.) of steam per shaft hp.-hour, but this must not be taken as a representative figure for steam hoisting, as owing to the small amount of work done by this hoist the standby losses are exceptionally high. Only a very rough efficiency comparison can be made, and therefore the comparative figures of cost are more important.

The average monthly cost of each of the three winders over the three months April, May and June, 1916, is given in the table, and it is stated that the figures for the next three months are practically the same, there being only a difference in the third-place decimal.

AVERAGE MONTHLY COST OF WINDERS

	Ward-Leonard	Three-Phase	Steam
Average shaft horsepower-hours	25,436	26,124	20,425
Attendance, oil and engine-room stores, per useful shaft horsepower, cents	0.316	0.322	0.352
Repairs, wages and stores per horsepower, cents	0.194	0.584	0.070
Power, electric and air or steam per horsepower, cents	1.786	2.076	3.492
Total cost per horsepower, cents	2.296	2.982	3.914

The first item, attendance and engine-room stores, includes all engine-room wages and stores except winding-engine drivers' wages, which are charged direct to hauling and do not come into the power account.

The second item, "repairs," includes all electrical and mechanical supervision, inspection and repairs.

The third item "power," for the electric hoists, includes the cost of electricity and air power. The power required for the brake engines is taken from the general mine air supply, the small compressor in the winding-engine room coming into operation only when the mine pressure drops below 60 lb. (27 kg.) per square inch. "Power" for the steam hoist includes coal, oil, water, wages and maintenance of the boiler-house plant and is the cost of steam power delivered to the engine house.

The Ward-Leonard costs need no comment, and are representative of the cost of this hoist for the last two years.

In the three-phase costs the repairs item is slightly above the average over two years, and the excess over

the Ward-Leonard hoist is chiefly accounted for in extra maintenance of the high-tension contactor panels and the liquid controller, also extra supervision. The power cost is a reflection of the over-all efficiency. The air power charged to this hoist is in excess of the Ward-Leonard, as with a three-phase hoist considerably more braking is required.

On the steam hoist the low repair cost is due to the hoist being new, no repairs being yet required. The present charge is chiefly the cost of examination. Regarding the power cost, it is said that this hoist was delivered and erected in 1915 and embodies all the latest improvements of the makers for an efficient steam hoist. It is at a disadvantage compared with the two electric hoists so far as length of wind is concerned, and would no doubt show a lower figure if the average wind were increased. Against this must be taken into account the fact that the whole plant is practically new, and any saving in steam consumption will probably be counterbalanced by extra repairs and maintenance to the boiler-house plant. Therefore, although the work done on this winder will increase, the cost of power will probably not fall below the present figure. On the other hand, the repair cost will increase.

Comparing the three types of winders, the Ward-Leonard is not only the most efficient and cheapest both in power and maintenance, but is by far the easiest winder to operate.

The three-phase costs more in power and maintenance, and when winding at low speeds, or lowering loads of men and material, requires very careful handling.

The steam winder is easy to operate, but so far as power is concerned appears more expensive than the electric hoists. This is, however, a question of price per kilowatt-hour and load factor. With the present high power rate in South African mines, based on a 70 per cent group load factor, any additional low-load-factor supply that reduces the group factor may increase the price of supply. It is only fair to the other mines of the Group that any mine installing new winding plant shall be debited with the extra cost of its supply based on load factor.

The two electric winders were installed when the general electrification of the Rand took place, and although the load factor of the Ward-Leonard is below 25 per cent and the three-phase 32 per cent, the present power charge is at the base rate of 1.05 cents per kilowatt-hour, other high load-factor plant bringing the group factor up to 70 per cent.

The steam winder has a load factor below 25 per cent and was installed in preference to an electric winder partly on account of the extra power cost, and for a fair comparison the author states that the cost of the electric winders must be increased by the extra power cost based on the low-load factor. He figures that if additional cost of power is assumed for a 25 or 32 per cent load factor, this would bring the total cost of the Ward-Leonard system to 4.406 cents and that of the three-phase system to 4.372 cents per shaft per horsepower-hour.

"In conclusion, for surface winding, given the same capital cost for installation and the present ruling high power rate on a low load factor, it appears that steam is the cheaper power with a load factor below 35 per cent and electricity above 35 per cent, and from figures obtained on hoists on the Group mines this appears to hold good for hoists up to 800 hp."

Generators, Motors and Transformers

Rotary Converters.—G. A. JUHLIN.—The first part of a paper read before the (British) Institution of Electrical Engineers on the voltage regulation of rotary converters. Several different schemes have been devised for the purpose of voltage regulation, but of these only two have found extensive use in Great Britain. They are described by their characteristic features as (1) reactance control, and (2) booster control.—London *Electrician*, March 9, 1917.

Parallel Operation of Transformers.—J. LINDLEY THOMPSON and S. AUSTEN STIGANT.—The conclusion of their long illustrated article on the parallel operation of static transformers. The present installment deals with polyphase transformers. The "phasing out" of three-phase transformers is described, tables and diagrams being given which show possible voltage measurements obtainable. Results of paralleling dissimilar groups of transformers are described, and in conclusion the effects of position of junctions to busbars or main cables, temperature and power factor are discussed.—London *Electrician*, Feb. 16, 1917.

Balances for Three-Wire Direct-Current Systems.—THOMAS CARTER.—The conclusion of his long illustrated serial on this subject. In this installment the author gives a general rule for an easy method of finding tapping points on lap-wound or wave-wound armatures, with numerical examples.—London *Electrician*, March 9, 1917.

Traction

Glasgow Tramways.—An editorial note commenting on the Glasgow tramways as the ideal municipal traction system of Great Britain. In 1894 the tramways, which were then run by private enterprise, were taken over by the city, and in 1901 the system was converted from horse traction to electric traction on the overhead trolley. Since then there have been various extensions, and the capital expenditure has risen to a total of $19,175,780. Now the whole capital debt, including that for all extensions, additions to and improvements of rolling stock, etc., has been wiped out in the short period of sixteen years, and it is stated that "the whole undertaking is in excellent condition, and the tramway fares are said to be the lowest in the world."—London *Electrician*, Feb. 16, 1917.

Installations, Systems and Appliances

Non-Inflammable Switch Oil.—G. STERN.—Experiments have recently been made by Vogelsang with carbon tetrachloride with a view of using it in oil switches. The present author describes what has been done along the same line by the A. E. G. On the occasion of a visit in 1910 to Chicago the author found that carbon tetrachloride was being used with high-tension fuses to suppress the arc which is formed on the blowing on the fuse. It was supposed to have advantages over oil on account of the fact that it was not so easily inflamed. However, it was found that the arc caused a considerable carbonization of the fluid, and that the particles of carbon were liable to restart the arc if a heavy load was carried by the fuse. Moreover, free chlorine was always present. Further experiments with carbon tetrachloride were, therefore, discontinued, because it was found that the chlorine always attacked the fuse steadily, and after a short time the fuse was

liable to blow while carrying the normal current. In fact, different metals were left lying in the laboratory for lengthened periods in carbon tetrachloride, and all were found to be attacked till they gradually became unrecognizable. Other chlorine combinations were, therefore, tried, adding various substances, which were intended to fix the free chlorine. One of the switch oils of this character, said to be non-inflammable, consists of pentachlorethane (C_2HCl_5), which is better than carbon tetrachloride, inasmuch as it boils only at 160 deg. C. The specific gravity is 1.658, and the dielectric constant is 2.25. The fluid begins to solidify at —18 deg. C. At ordinary temperatures it does not attack copper, iron or lead, though it does so if heated. If heated for a length of time in contact with water, hydrochloric acid is formed. It decomposes very decidedly under the action of the electric arc. A direct-current arc, carrying 25 amp. at 110 volts, was formed in the fluid, and large quantities of chlorine and hydrochloric acid were formed and remained in solution, giving a strongly acid reaction. The copper electrodes were also much attacked. Short-circuit tests showed that the non-inflammable oil is a much less satisfactory extinguisher of the arc than the normal oil. Under similar condition in the two cases the arc lasts three times as long with the non-inflammable oil as with the normal oil. Taking the insulating resistances of the two at 18 deg. C., with non-inflammable oil when fresh it is 1200 megohms and after the short-circuit it is 120 megohms, whereas with the normal oil it is 28,000 megohms in both cases. In the author's opinion it is hardly likely that any advantages would result from the use of non-inflammable oil, even if mixed with normal oil in any proportions. Any such mixture might quite possibly accentuate the failings of both without producing any good result whatever.—From *Elek. Zeit.*, No. 22, 1916, translated in abstract in London *Electrician*, March 9, 1917.

Electrophysics and Magnetism

Effect of Previous Filtering Upon the Absorption Coefficients of High-Frequency X-Rays.—S. J. ALLEN and L. M. ALEXANDER.—An account of an experimental investigation in which the absorption coefficients were measured for the high-frequency X-rays from a Coolidge tube after filtering through various elements at a voltage of 120,000. These absorption coefficients show clearly the presence of the *K* radiation of platinum, gold, lead and bismuth. With a tin filter the values of the absorption coefficients for the "end rays" show harder rays than any that have been published up to this time. Experiments on the scattering were made, showing that the low-atomic-weight atoms scatter more than the high.—*Phys. Review*, March, 1917.

Lecher System.—F. C. BLAKE and CHARLES SHEARD.—The fourth paper in their serial on the free vibrations of a Lecher system. This installment deals with the effect which the kind of induction coil and the current strength have upon the wave system. The sharpness of the wave peaks of a Lecher system depends very much upon the induction coil used as a source of power, the best effects being obtained with a coil giving a fat spark. The peak intensity is directly proportional to the current strength. The tone intensity is dependent upon the edge-on distance between the capacity plates, there being for any given tone an optimum edge-on distance. The logarithmic law for the capacity per unit length of two parallel wires also holds for the change in capacity of a condenser as the distance between it and an equal condenser is varied edge-on.—*Phys. Review*, March, 1917.

Units, Measurements and Instruments

Measuring the Voltage and Frequency of Alternating Currents.—JOHANN SAHULKA.—The author describes a frequency meter somewhat similar to the recent instrument of Peukert. As shown in Fig. 1, a hot-wire instrument is connected between the conductors L_1 and L_2.

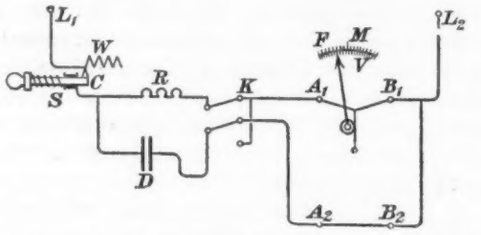


FIG. 1—CONNECTION FOR USING A VOLTMETER AS A FREQUENCY METER

In the one arm there is the hot-wire A_1B_1 and an inductionless resistance, R; in the parallel branch there is a similar hot-wire, A_2, B_2, and a condenser or inductive resistance D. If the change-over switch K is moved over, the active hot wire, A_1, B_1, which is connected to the instrument, is then connected to D, and the hot wire A_2, B_2, is in series with R. Both branches are connected to a sliding resistance W, which, owing to the action of a spring switch S, is normally switched out of circuit. If the switch K has the position shown in the drawing, the voltmeter scale V can be made to read the frequency. This is done by the following procedure: The switch S is closed and the sliding contact C is so adjusted on the resistance W that the pointer on the apparatus points to a certain position M on the scale. The switch K is then changed over; the frequency can then be read off on the frequency scale. If D is a condenser, then the frequency scale can be calculated. Let us call the voltage corresponding to the position M on the scale by the symbol E_n. When the switch K is moved over and the instrument is used as a frequency meter, let the reading be E. Let r be the resistance of the apparatus when used as a voltmeter—*i.e.*, the sum of the resistance R and A_1B_1; let C be the capacity of the condenser, and p the periodicity. Then

$$p = \frac{E}{E_n 2\pi C r}.$$

The readings on the frequency scale vary inversely with the value of the capacity chosen, so a simple adjustment requires to be made if another capacity is taken. The value of the resistance of the hot wire has nothing to do with the reading of the frequency meter, because the reaction of the condenser, even at the lowest frequencies, can be made equal to the impedance of the condenser branch. If the capacity is gradually decreased in value, the range of the frequency meter can be raised as much as is desired. A disadvantage of the hot-wire instrument is that it takes a fairly high current; therefore, in the measurement of low frequencies a condenser of considerable capacity is needed, and it is difficult to find space for this inside the meter.—London *Electrician*, March 2, 1917.

Compound Thermo-Element.—Fig. 2 shows the construction of a useful compound thermo-element permitting temperature measurements to be made simul-

taneously at two points *A* and *B*. The couple terminating at *A* is composed of platinum and platinum-rhodium wires, and to the other ends of the latter there are connected respectively a silver wire and a constantan-silver thermo-couple. The three branches thus obtained are connected through terminals, I, II, III, to two galvanometers, *A'*, *B'*. Such a combination has many useful applications, particularly for the measurement of flue-gas temperatures at the front and back of a section of flame-table filled with pieces of refractory material on the Bonecourt system. The compound

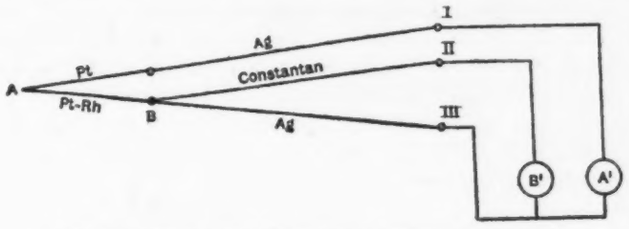


FIG. 2—DESIGN FOR COMPOUND THERMO-ELEMENT

thermo-element is cheaper and more compact than two separate couples, and for the above purpose the platinum couple was made 60 cm. (24 in.) long, and the silver-constantan couple was made 160 cm. (63 in.) long. The whole was mounted in a steel tube of 8 mm. internal and 12 mm. external diameter, which was so small as not to disturb appreciably the gas flow in the flame tube under observation. The high-temperature end of the compound instrument was protected by a quartz sheathing. The couples being calibrated separately for a cold-junction temperature of, say, 20 deg. C., the reading of the galvanometer, *B'*, in conjunction with the calibration temperature, gives the temperature of *B*, and this being known, the reading of galvanometer *A'* (which measures the temperature difference between *A* and *B*) permits the temperature of *A* to be deduced. In the special application noted above the couple *A* measured the temperature of flue gases at the entrance to a flame tube, while *B* measured the temperature at the back of the refractory "filling" in the latter.—From an article by Hilliger in *Zeit. des Vereins deutscher Ingen.;* translated in abstract in London *Elec. Review*, March 9, 1917.

Miscellaneous

National Electric Light Association.—In a long editorial on "Some Points in American Progress," the last volume of reports of the (American) National Electric Light Association is reviewed, with special reference to the progress report of the secretary, T. C. Martin. "The 'Proceedings of the Convention of the National Electric Light Association' form a volume showing that the association pays attention to matters which the technical societies in this country [England] leave out of their programs. It is largely the human element that counts, and we are inclined to think that our societies would do well to pay greater attention to this side of industry than they have in the past."—London *Electrician*, March 9, 1917.

Springs.—C. E. SQUIRE.—An abstract of a paper read before the (British) Junior Institution of Engineers. After enumerating the six principal types of springs, the author discusses some principal facts of manufacture and testing, characteristics of spring steel, stresses in springs, energy diagrams and limits in manufacture.—London *Electrician*, Feb. 16, 1917.

Book Review

HYDROELECTRIC POWER. By Lamar Lyndon. New York: McGraw-Hill Book Company, Inc. Vol. I. Hydraulic Development and Equipment. 500 pages. 235 illustrations. Price, $5. Vol. II. Electrical Equipment and Transmission. 360 pages. 194 illustrations. Price, $3.50.

Vol. I of this work is about the most concise treatment of hydraulic engineering from the standpoint of design and construction that is now available. The volume has been written by a consulting engineer of experience, and the design viewpoint rather than operation and maintenance prevails throughout. The work is notable for its completeness rather than the newness of material presented, since it incorporates fundamental and standard formulas that have been used in the design of water-power developments. In interpretation of this information lie the practical difference and usefulness of the book as compared with other works available. The section on dams is perhaps the most distinctive chapter of the book and occupies 112 of the 471 pages of text matter. In this section are found several formulas for solid dams which the author rightly claims as new. Other subjects treated include: Flow in streams; weirs and orifices; power variation and storage; artificial waterways; pipe lines and penstocks; dams, movable crests for dams; headworks; waterwheels and speed regulation of waterwheels.

Vol. II, which deals with the electrical equipment of stations and the main features of transmission systems, is considerably more general in its discussions on design than Vol. I. The author has evidently not attempted to treat the electrical design of hydroelectric systems in detail, for only general considerations are given on station design in some thirty-seven pages, with the layout and installation of transmission lines treated in forty-five pages. Of the remainder of the book sixty-four pages take up the theory on which transmission lines are calculated and 180 pages deal with the descriptive classifications of the equipment now available for hydroelectric plants. System operation and the fundamental requirements thereof are only slightly touched upon in the book in connection with a chapter of twenty-five pages on line protection and the one on insulators. Features of the design, installation and operation of substations are very briefly dealt with in eight pages of text, which include seven illustrations. This volume forms a very good supplement to the first volume but cannot be considered an adequate treatise on the electrical design and installation of station equipment or on transmission systems. Taken as a whole the two volumes form a very good reference text on features of the modern hydroelectric power plant and will probably serve a useful purpose as a practical text-book for schools and colleges.

Books Received

PRELIMINARY MATHEMATICS. By Prof. F. E. Austin. Published by the author at Hanover, N. H. 174 pages. Price, $1.20.

THE "MECHANICAL WORLD" ELECTRICAL POCKET BOOK FOR 1917. Baltimore: The Norman, Remington Company. 240 pages. 120 illustrations. Price, 45 cents.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

BUSY MEN AID N. E. L. A. CAMPAIGN FOR NEW MEMBERS

Walter Neumuller, Telegraphing to the Electrical World from Kansas City, Reports Success of Country-Wide Solicitation

Walter Neumuller, chairman of the membership committee of the National Electric Light Association, telegraphed to the ELECTRICAL WORLD from Kansas City, Mo., on April 5 in regard to the progress of the campaign for new members the following optimistic message:

"The truth of the old saying, 'When you want something done well go to a busy man,' has been proved again during the week just closed. More than 200 busy central station executives in all parts of the country, all enthusiastic members of the National Electric Light Association, have given freely of their time to visit central stations in neighboring communities and invite them to join this thoroughly representative organization of the industry.

"While it is still too early to make any definite statement upon the total result of this novel and interesting campaign, as reports have not reached the chairman of the membership committee in New York from all the Western cities, the applications already in hand indicate that after the smoke has cleared practically every central station in cities of 10,000 population and over will have been enrolled, in addition to many in the smaller communities.

"The co-operation from the geographic sections has been most enthusiastic and has greatly simplified the preparation for this work."

DALLAS FRANCHISES ARE APPROVED BY THE PEOPLE

Measures Supported by Messrs. Strickland and Hobson Are Approved by Two to One Vote—Waiting for Court Decision

Lighting and traction franchises sought by J. F. Strickland and C. W. Hobson and submitted to vote of the people of Dallas, Tex., were approved in the election on Tuesday of this week by a vote of two to one, or by a majority of about 3600. Regardless of the vote, Messrs. Strickland and Hobson will not begin reorganizing the systems until the contest of the city election on the charter amendment of last April is decided. The old charter prohibited the granting of new franchises until the old franchises expired, and the charter amendment was to repeal this.

"The franchises adopted in Tuesday's election are absolutely dependent on the charter amendment adopted last spring," Mr. Strickland said. "Franchises will be void and we will await the court's decision. If it is in our favor consolidation plans will be carried out immediately.

"The old city charter prohibited the granting of franchises except with 4 per cent gross production tax, and also prohibited an indeterminate franchise."

C. W. Hobson said: "We will do nothing toward carrying out our agreement in reorganizing traction lines until this contest is decided in our favor."

Ninety days are provided for traction and lighting consolidations to be carried out and a decision is expected before that time expires.

"WIRE YOUR HOME WHILE YOU CAN" IS THE SLOGAN

J. M. Wakeman Says that We Should Realize that High Prices Are Here and that the Great Campaign Will Be Successful

The Society for Electrical Development reports that great interest is being shown in the "wire-your-home-time" campaign, which made its official and auspicious beginning on April 1.

James M. Wakeman, general manager of the society, prepared the following statement at the request of the ELECTRICAL WORLD:

INDICATIONS POINT TO SUCCESS

"Every indication points to a very successful 'wire-your-home-time' campaign this year. The $1,250 contest for society members is arousing enthusiasm on the part of salesmen of the central stations and contractors. This contest will also give us an excellent opportunity to check results of the drive.

"A few companies—but really very few considering—contend that, owing to the high cost of materials and labor, they will not be able to enter into the movement. Those who make this contention, however, are not at all comparable with the number entering the drive.

"In my opinion, based upon a general knowledge of conditions in the industry and the best information available, I do not think that prices of electrical products will decrease materially for months, possibly for years to come. History shows that when prices go up and remain up for any considerable period, they very seldom go down, especially with conditions such as exist to-day. This is true in the food and textile industries and will prove equally true in the electrical industry.

"PRICES WILL BE HIGHER"

"The day of high prices is here. The central stations and contractors are beginning to realize this and to go after the business as though they were at low basic prices. Undoubtedly next year, and possibly for two or three or more years to come, prices will be so much higher that people will be glad they went after the business in the spring of 1917, when there was more prospect of adding customers to the lines than there will be then.

"It is quite safe to say that with war throughout the world, with men taken from industries and put into war

endeavors, labor costs will go up, prices will go up, and we will look back reminiscently to the ante-bellum prices of electrical products.

"'Wire-your-home-time,' April 1 to May 15, is the time for the industry to unite in the greatest of all housewiring drives. The society will gladly provide the ideas on how to get the business. It is up to the individual central stations and contractors to cash in."

GIFTS OF FLAGS TO SCHOOLS BY ALABAMA POWER COMPANY

Third Town, Having Fulfilled Conditions of Securing Ten New Sign Customers, Is Presented with an Electric Flag

In accordance with its policy of presenting school authorities with flags in towns which have complied with the requirements that it has set, the Alabama Power Company has presented the school board in Attalla, Ala., with a 10-ft. double-face electric sign showing a waving electric American flag. This sign was installed on the top of the school building, where it can be seen from all parts of Attalla.

"OLD GLORY" ON AN ALABAMA SCHOOL

The sign burns from dusk until 10 o'clock every night except Sundays, when it burns until 12 o'clock, and serves as a reminder of the duties that all owe to their country in the present time of need. The sign is equipped with red, white and blue color caps, and is also painted so as to show to advantage in the daytime as well as the night. The energy for the flag is supplied free by the Alabama Power Company.

This is the third town on the Alabama Power Company's system which has been presented with a flag of this type, having fulfilled the conditions of securing ten new sign customers.

W. E. Mitchell, operating manager of the Alabama Power Company, writes to the ELECTRICAL WORLD: "The management of the company has felt for the last two years that it is the proper thing to assist in increasing the loyalty and patriotism of all people in the district in which we serve and this is one way to do it."

SYMPOSIUM AT BOSTON ON POWER PLANT PRACTICE

Convention Under Joint Auspices of the Local A. I. E. E. and A. S. M. E. Sections Listens to Papers on Recent Developments

A largely attended and enthusiastic convention of power plant engineers was held this week at Boston under the auspices of the Boston sections of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers. The meetings were held at the Engineers' Club and at the Wentworth Institute, under the chairmanships of Profs. Arthur L. Williston and F. R. Hutton.

The first session on Wednesday evening, devoted to recent developments in steam generation, was opened by a paper on "Developments in Fuel Oil Versus Coal," by Frederick Ewing, mechanical engineer of the Mexican Petroleum Company, New York. This was followed by papers on "Modern Stoker Practice," by R. Sanford Riley, president Sanford Riley Stoker Company, Worcester, Mass.; "High Pressures and Temperatures in a Modern Station," by Irving E. Moultrop, assistant superintendent of construction, Edison Electric Illuminating Company of Boston; "Some New Investigations on Combustion in Boiler Furnaces," by Prof. Lionel S. Marks of Harvard University, and "High Temperature Insulation of Boiler Settings," by P. A. Boeck, New York.

Isolated plants and central stations were the general topic of a session Thursday afternoon. The papers listed were: "Principles of Power Plant Management," by Walter N. Polakov, consulting engineer, New York; "Interesting Isolated Plants," by A. R. Meek, Eastern manager Ridgway Dynamo & Engine Company, Boston, Mass., and David A. Chapman, efficiency engineer, Boston; "Engineering Features and Results at the Holyoke Municipal Plant," by John J. Kirkpatrick, manager gas and electric department, Holyoke, and "Co-operation Between Isolated Plants and Central Stations," by P. P. Moses, consulting engineer, New York.

Developments in prime movers, condensers and auxiliary equipment were featured at the final session Thursday evening, the program containing the following papers: "Purchased Power," by John A. Stevens, consulting engineer, Lowell, Mass.; "Engineering Features of a Combined Heat and Power Distribution," by R. A. Langworthy, Boston, Mass.; "Developments in Steam Turbines," by Richard H. Rice, General Electric Company, Lynn, Mass., and "Recent Developments in Condensers and Modern High Vacuum," by C. H. Bromley, *Power*, New York.

A get-together dinner was held Thursday evening.

JOVIAN PROBLEMS AND THE ELECTRICAL LEAGUE

Two-Day Session of Special Commission Appointed by Jupiter Doherty to Consider Their Relation Proves Enthusiastic

The special commission appointed by Reigning Jupiter Henry L. Doherty to study Jovian problems in relation to the electrical leagues met in the club rooms of the Cleveland Electrical League on April 5. The sessions extended through that day and the next one. The members were enthusiastic in their work, and many subjects were taken up and exhaustively discussed.

Electrical Industries Ready to Serve

Conferences Held and Plans Made to Determine the Best and Most Effective Methods of Aiding the Nation

ALL branches of the great electrical industries are keenly alive to their duty and responsibilities in the national crisis. Reports to the ELECTRICAL WORLD from all parts of the country show that the electrical industries are actively engaged in formulating measures which are necessary for the public safety. For the ELECTRICAL WORLD to divulge or discuss these measures in their relations to individual properties would not be in the public interest.

It is sufficient to say that both in physical measures and in conference the different sections of the industries are responding to the call for defense of the nation. The measures taken vary in different localities and are tempered or strengthened according to the necessities in particular cases, but are being pushed with vigor.

The great importance of maintaining central station service is of course a foremost consideration in all that is done. This demands military assistance and hearty co-operation. Military measures, however, can be supplemented by engineering advice which will accentuate sharply the ordinary steps for safety. Among the highly essential accessories to ordinary means of protection are flood-lighting, barbed wire or wire charged heavily with energy, the posting of sharpshooters at vantage points, etc.

GIVE AND ASK CO-OPERATION

It will be the aim of the central station officials generally to give to and ask from the police and military authorities the fullest degree of co-operation.

Among the questions that press for solution is that of the maintenance of organization of the operating staffs of the central stations and of the manufacturing establishments which can be of service in the production of needed supplies. This question will probably receive definite attention. There is a general sentiment that operating staffs will be able to show returns which will prove of great ultimate military value while remaining in their present positions.

As an instance of the attitude of large companies there may be cited the announcement of President Herbert A. Wagner of the Consolidated Gas, Electric Light & Power Company to men in the employ of the company who are called into the army or navy or who shall hereafter volunteer or be called into the service. Such men will be paid full wages during active service with the government less the government pay, and will be given employment by the company upon their return.

The Worcester Electric Light Company has given the use of one of the windows in its store for an exhibit to stimulate recruiting.

The New York Edison Company has placed a great fleet of vehicles at the service of the police authorities.

At the National Defense Convention, held in New York, the Seventy-first Infantry escorted fifty prominent persons in electric vehicles up Fifth Avenue.

A. I. E. E. APPOINTS COMMITTEE OF DEFENSE

Many conferences have been held in the Engineering Societies Building, New York, to further steps by the engineering industries to support the government. A special committee of national defense, appointed by the executive committee of the American Institute of Electrical Engineers, is as follows:

John H. Finney, chairman; F. C. Bates, secretary; B. J. Arnold, A. H.

THE INDUSTRY'S PLEDGE

As Expressed by Its Leaders

FROM E. W. RICE, JR., PRESIDENT GENERAL ELECTRIC COMPANY

To the ELECTRICAL WORLD:

The President's message expresses in simple but powerful words the solemn and final judgment of a great peace-loving people on the issues of this great war.

While every thoughtful citizen must realize the gravity of the step which we are now taking, there will be no holding back, and no matter what trials the future may have for us, the knowledge that we are fighting in defense of all that makes life worth living will enable us to persevere until victory for ourselves and our natural allies has been obtained.

Men of the electrical industry, representing every phase of scientific and engineering activity, will be able to render invaluable service, as a modern war, as is well known, cannot be won by courage and strength alone, but demands skill in control of complicated machinery and the use of scientific methods all the time and everywhere.

This is not a war between peoples, but a mighty conflict of irreconcilable ideals of government and of life, and there can be no question, therefore, that every citizen of this country who treasures our ideals will welcome the solemn privilege, which has been forced upon him, of fighting for them. We all devoutly hope and believe that the entrance of our nation on the side of liberty and humanity will bring to a speedy end this terrible scourge of the world.

E. W. RICE, Jr.

Schenectady, April 4, 1917.

FROM SCHUYLER SKAATS WHEELER, PRESIDENT CROCKER-WHEELER COMPANY

To the ELECTRICAL WORLD:

It is evident that the war activity of this country will considerably increase its industrial activity, although, as has already been pointed out in connection with two or three industries, such as steel and copper, the total new demand will not for some time form much of a percentage of the total capacity of individual industries, except in a few cases, such as shipbuilding.

I believe, however, that the present or immediate demand will be followed by a general and increasing one which will lead to great and continued industrial activity, to which the work of furnishing supplies to the Allies in increased quantities and varieties will contribute largely. The Allies will draw more of their supplies from us, because the conditions will be more favorable to them.

What is equally interesting is the great impetus that electrical invention and industrial activity will receive in this, already the leading electrical country of the world. SCHUYLER SKAATS WHEELER.

Ampere, N. J., April 4, 1917.

Babcock, Philander Betts, H. W. Buck, J. H. Cuntz, J. J. Carty, D. C. Jackson, John W. Lieb, P. M. Lincoln, Ralph D. Mershon, A. M. Schoen and J. Franklin Stevens.

A sub-committee of the foregoing, composed of Messrs. Buck, Finney, Mershon, Arnold and Bates, was appointed to co-operate with similar committees of the other national engineering societies.

The A. I. E. E. is sending out this week circulars giving instructions to members of engineering societies who contemplate offering their services to the army and navy, with a résumé of data regarding the different classes of service.

PREPAREDNESS ACTIVITIES OF THE A. I. E. E.

F. L. Hutchinson, secretary of the A. I. E. E., stated:

"The American Institute of Electrical Engineers has taken an active part in various movements for national preparedness.

"Early in 1915 a suggestion was made that several of the national engineering societies appoint committees for the purpose of co-operating with the War Department in the formulation of a plan for the organization of a Reserve Corps of Engineer Officers. Committees were accordingly appointed by the American Society of Civil Engineers, American Institute of Mining Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers and American Institute of Consulting Engineers.

"The formation of the Engineer Officers' Reserve Corps was authorized by Congress under Sections 37, 40, 49 and 51 to 53 of the national defense act, approved June 3, 1916.

"The committees of the Institute and the other societies actively co-operated with each other and with the War Department both before and since the passage of the act.

"On July 19, 1915, the Institute was invited by President Wilson to select two members for appointment by the Secretary of the Navy upon a proposed advisory committee, to be presided over by Thomas A. Edison.

"In January, 1916, the Institute received an invitation from the President of the United States to nominate a representative in each State in the Union, subject to the approval of the Secretary of the Navy, to act in conjunction with representatives of the American Society of Civil Engineers, American Institute of Mining Engineers, American Society of Mechanical Engineers, and American Chemical Society, in collecting data for use in organizing the manufacturing resources of the country for the public service in time of emergency. A list of these nominees was subsequently submitted to the Secretary of the Navy and the appointments were made.

AVAILABILITY OF MEMBERS

"On Feb. 8, 1917, the executive committee of the Institute issued a circular to the membership in the United States, together with a data sheet, with a view to tabulating the experience and availability of its members for military or naval service, as officers or enlisted men, and assisting them in obtaining appropriate positions in the various organizations to be formed in the event of war. About 1800 members have thus far responded to this appeal, and the sheets continue to be received daily.

"The latest action taken by the Institute was the appointment of a committee on national defense."

THE INDUSTRY'S PLEDGE

As Expressed by Its Leaders

FROM H. W. BUCK, PRESIDENT OF AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

To the ELECTRICAL WORLD:

The formal acknowledgment of a state of war in this country now seems to be a question of only a few hours. This colossal enterprise which we are about to undertake must bring into play to a superlative degree all of the forces which have worked for the development of this country during recent years.

In this great evolution no class of men have contributed more than the electrical engineer, and his work in the war must continue to be of equal importance.

War as now fought is largely fought by engineers directly or indirectly, and the electrical engineers of America will doubtless soon show that they can rise to the occasion and live up to the best traditions of the profession in initiative, energy, inventiveness and patriotism. H. W. BUCK.

New York, April 4, 1917.

FROM HERBERT A. WAGNER, PRESIDENT NATIONAL ELECTRIC LIGHT ASSOCIATION

To the ELECTRICAL WORLD:

In this time of national crisis, on the eve of our entering into the world war, it behooves us, as employers and individuals in the great electrical industry, to consider it our first and most important duty to take stock of our ability and facilities to assist the government in its prodigious task of preparation and organization to uphold successfully the principles for which we stand before the world.

The spirit of patriotism and loyalty to our country should be our inspiration, and the desire to be of service our first consideration.

Organization and preparation for the most efficient use of the trained men in every community are the first essentials. In the electrical industry we have brought organization to a most advanced degree, and "preparedness" for the demands of the public has been our watchword. Before us now lies the possibility for the organization of our forces for assisting the government, through our power facilities and engineering ability, in promoting the most efficient production of supplies and munitions by local industries; in assisting the railroads, through the supply of power and otherwise, in solving the new transportation problems confronting them; and in electric service and engineering assistance in perfecting local defenses.

We pride ourselves on being leaders among our local industries, and we should now be leaders in encouraging patriotism and service to our country. It is highly probable, however, that a large number of the employees of central station companies can be used to better advantage, in view of their special training, for local work in connection with the most efficient organization of industrial production. Organization on this basis should be promptly and carefully studied before numbers of our specially trained men enlist for ordinary service. The National Electric Light Association can be depended upon to offer its services, and its organized facilities, for every assistance possible along these lines.

In this great crisis in the history of our country and in the upholding of the principles of democracy throughout the world we should not be backward in emulating the spirit of the patriots of '76 in pledging to the cause our lives, our fortunes and our sacred honor. HERBERT A. WAGNER.

Baltimore, April 4, 1917.

IT IS A "NECESSITOUS DUTY" TO PROVIDE FOR DEPRECIATION

Georgia Commission Points to Importance of Including an Allowance for Gradual Loss in Value and for Bond Discount

An application of the Georgia Railway & Power Company, Atlanta, Ga., for approval of the issue of $420,000 non-interest-bearing scrip in payment of dividends on its first preferred cumulative 6 per cent stock was denied by the Railroad Commission of Georgia. Through the opinion of Chairman Candler the commission directs attention to the "necessitous duty" of a public utility to provide for depreciation. The opinion says:

DISCOUNTS AND EXPENSES IN SELLING BONDS

"Included among the book assets of the company as of Nov. 30, 1916, under 'Suspense Account' are three items aggregating $279,722.31, representing unextinguished balances of discounts and expenses in the sale of bonds at less than par.

"These items are to be extinguished during the life of the bonds by annual charges against them, to be taken out of earnings. Since Nov. 30, our understanding is that there have been additional sales of bonds of both the Railway & Power Company and the Railway & Electric Company, issued against constructions and acquisitions prior to Oct. 31, 1916, upon which there are discounts which must be extinguished in the same way.

"It does not appear to us that mere book assets, as indicated above, can be properly included in a divisible surplus.

"There is not included among the liabilities of the company any charge or provision for depreciation in the properties of either the Railway & Power Company or the leased property of the Railway & Electric Company.

"Every just and reasonable rate prescribed by this commission contemplates such provisions out of the earnings thereunder. Ordinary maintenance and repairs do not and cannot take care of depreciation and obsolescence. No utility can, year after year, pay out every dollar of its earnings above operating expenses and fixed charges without facing disaster when the life of its plant has been spent and no accumulation or provision has been made against exhaustion, decay or out-of-dateness.

REVOLUTIONARY INVENTIONS POSSIBLE

"The properties of the Railway & Power Company are, as a whole, comparatively new and up to date, but new discoveries and new applications in hydroelectric developments are frequent and may be revolutionary at any time. This is also true as to the entire field of electricity and its uses.

"We cannot undertake to say what sum should have been charged against the claimed surplus in the present case, as no evidence has been submitted on this subject. We are satisfied, however, that a depreciation charge or reserve should have been set up against the claimed surplus.

"These preferred stockholders can have no dividend on their stock unless there are in fact net earnings. Assuming that there are net earnings, the directors of the company have the discretion and power to use the profits of any given year in the improvement of the company's property to the exclusion of any dividend.

"We cannot escape the conviction that dividends ought not to be declared when there are no net earnings available for prompt payment; that a dividend ought not to be allowed to become a long-term obligation, particularly of a public utility owing services to the public the adequate and sufficient discharge of which might be seriously affected or rendered impossible at some time by an accumulation of deferred debts of this character.

"We doubt the policy and question the propriety of assenting to the spread of payments of a dividend over a number of years in the future.

"If this company has sufficient net earnings, after providing for operating expenses, taxes, fixed charges, proper maintenance and sufficient depreciation reserve and working capital, to insure the operation of its properties and the discharge of its duties to the public, it has the right and its directors the power to pay dividends out of such earnings. There can be, under such conditions, no necessity for the giving of the scrip obligations under discussion, and the commission is without power to authorize their issuance."

PUBLIC SERVICE CORPORATION CHANGES IN ORGANIZATION

Mr. Ferrand Assistant to the President, Mr. Young Vice-President, and Mr. Osgood Vice-President and General Manager of Electric Company

Changes in the personnel of the Public Service Corporation of New Jersey and its subsidiaries were announced on April 2. George J. Roberts, first vice-president of the companies, retired of his own volition. He had been vice-president for nearly ten years, but underwent a serious operation last November and has never fully recovered his strength.

Mr. Roberts and P. Farmer Wanser, who is also in poor health, retired as directors. These withdrawals, together with the deaths of John J. Burleigh, Edgar B. Ward and Ferdinand W. Roebling, left five vacancies on the board. The membership was reduced from twenty-one to eighteen, and Percy S. Young and former Senator Edmund W. Wakelee were elected directors and also appointed members of the executive committee of the corporation and the operating companies.

Thomas N. McCarter was re-elected president of all of the companies. The vice-presidents of the corporation will not be designated numerically hereafter. Randal Morgan, Anthony R. Kuser and Messrs. Young and Wakelee were elected vice-presidents. Other changes were:

General Edwin W. Hine received a leave of absence for one year. Dudley Farrand and John L. O'Toole were appointed assistants to the president. T. Wilson Van Middlesworth was elected to succeed Percy S. Young as treasurer. William S. Barker, former assistant treasurer, was appointed comptroller. F. A. Neis was elected assistant treasurer. William H. Feller was elected assistant secretary to succeed Harry C. Stevenson, who was appointed assistant to the vice-president in charge of public relations. Farley Osgood was elected vice-president and general manager of the Public Service Electric Company to succeed Dudley Farrand. Martin Schreiber, engineer of maintenance of way of the Public Service Railway Company, was given the title of chief engineer.

ENGINEERING CO-OPERATION CONFERENCE IN CHICAGO

Third Annual Conference Voices Need of More Democracy in the Societies and of Attention to Employment Problems

The third annual conference on engineering co-operation, held in Chicago on March 29 and 30, laid down ten fundamentals, resolved to keep going, and urged that the national engineering societies make the engineering council democratic and take up the work. More than forty delegates registered, representing societies with a membership of 50,000. Nearly 300 engineers attended the banquet, which was participated in by practically all the Chicago engineering societies. The tentative plans of the Chicago Engineers' Club for a building to house all engineering societies were received with enthusiasm.

How the Canadian societies met the war crisis, as presented by J. S. Dennis, president of the Canadian Society of Civil Engineers, was the most prominent single feature of the conference. A tablet being erected in the society house in Montreal, on which 786 members are enrolled, indicates the extent to which Canadian engineers responded to the call. The desirability of further development in this country and in Canada along the line of professional unity was scarcely debatable, the speaker held. He would favor a democratic federation of all societies and pledged his support toward bringing in the Canadian organizations.

SUGGESTIONS FROM VARIOUS SOCIETIES

The roll call of societies showed:

Cleveland is assigning to each committee an energetic young man as secretary. The other committee men have not much time to collect data, and the fact of giving a young man something to do spurs him to action.

The civic activities of the Association of the South include killing a bond issue for water works, promoting the Muscle Shoals project, advice to city on proposition to buy a bankrupt railroad, and good-roads legislation.

The Indiana Society of Engineers has a legislative committee with a strenuous record, but C. Francis Harding, president, thinks that the state society would have no place if national societies were more active. He said that the branches of the national societies were not democratic and did not handle the employment problem efficiently.

The Society for the Promotion of Engineering Education wants to imbue the graduate with the ideals and purposes of various societies.

Peter Junkersfeld, for the American Institute of Electrical Engineers, stated that too many join a society to get a fixed reward. The A. I. E. E. publishes a monthly bulletin, provides a forum for the presentation of new ideas and an opportunity to form acquaintances. It has fifty lectures available and has an employment bureau.

ATTENTION TO EMPLOYMENT PROBLEMS

At the end of E. E. Olp's paper on "Employment, How It Is Accomplished," describing the machinery of an employment agency serving a high-grade clientele, suggestions were made to have a national committee on employment representing all engineering societies with sub-committees in larger centers and employing a paid secretary.

Prof. F. H. Newell and C. E. Drayer were reappointed chairman and secretary respectively of an administrative committee of five, three to be appointed by the chair, to continue the work outlined and to provide ways and means for its accomplishment.

ADDITIONAL DEVELOPMENT ON KERN RIVER, CALIFORNIA

Southern California Edison Company Project Involves an Estimated Cost for Completion of $4,000,000

The Southern California Edison Company of Los Angeles applied recently to the California State Water Commission for permission to appropriate 600 sec.-ft. (16.8 cu. m. per sec.) of water on the North Fork of the Kern River and on Salmon Creek in Tulare County. Since the first appropriations on this stream were filed about $881,700 has been expended in development. The estimated cost of completing the project, exclusive of transmission lines, is $4,118,295.

The new development would be known as Kern River No. 3. It would utilize a total fall of 800 ft. (243.8 m.) and generate 30,000 kw. The project calls for the construction of a concrete diversion dam 60 ft. (18 m.) high and 240 ft. (73 m.) long on top. The conduit from the diversion dam to the forebay would be 13.4 miles (21.6 km.) long. Part of this distance would be traversed in tunnel, part in open concreted flume, and part in an inverted siphon consisting of a steel pipe 9 ft. (2.7 m.) in diameter. The two penstocks varying from 7 ft. (2.1 m.) in diameter at the top to 5 ft. (1.5 m.) at the lower end would be installed.

The proposed plant is to supplement the present plant meeting increased demand. The installation is to be completed by July 1, 1922.

UTILITY AND WATER-POWER LEGISLATION IN IDAHO

Idaho Legislature Continues Regulatory Body and Takes Away Its Jurisdiction Over Municipal Public Utilities

As the Idaho Legislature has adjourned, its action regarding the Public Utilities Commission can be summarized.

The attempt to abolish the commission by repeal of the act which created it was a failure. In fact, it was never given serious support. The effort to eliminate the "necessity and convenience" clause met the same fate. Two unsuccessful efforts were made to amend the law so so as to give the commission supervision over securities of public utilities.

The Legislature passed a law, which the Governor approved, taking from the jurisdiction of the commission supervision over municipal public utilities and non-profit mutual telephone companies. In the future public utilities of these two classes will not have to secure a certificate of public convenience and necessity before they are allowed to install gas, water or light distributing plants.

The Legislature passed a memorial to Congress urging an investigation of the alleged water-power monopoly of Western States.

COMFORT AND CONVENIENCE IN TERMS OF ELECTRICITY

A New Booklet of the Commercial Section of the N. E. L. A. Describes the Lighted and Equipped Home

"The Comforts and Conveniences of Electricity in Your Home" is the expressive title of a house-wiring booklet which is being issued by the publications committee of the Commercial Section of the National Electric Light Association.

This booklet is available to members with the imprint of the company name and address at prices varying in

BOOKLET OF COMMERCIAL SECTION, N. E. L. A.

accordance with the quantity. In addition to its explanation of wiring it tells simply of the principles of lighting and of the enjoyment and privileges of electrical appliances.

PROGRESS TOWARD AGREEMENT IN LOS ANGELES SITUATION

Obstacles Are Being Removed One by One, and Final Agreement Is Now Believed to Be Almost in Sight

The Los Angeles Chamber of Commerce appointed recently a committee of fifty prominent citizens to confer with the Public Service Commission, the City Council and the power corporations regarding the obstacles to agreement on the proposed purchase of the distributing systems. The committee was to undertake the task of adjusting these differences.

The power companies had taken the stand that more than ten years would be required to develop the city's plans for generating power. On this account they asked that the city agree to buy from the companies all the steam plant power needed for another twenty years at prices to be fixed each five years by the State Railroad Commission, the city to be bound to this agreement only if the companies could offer the power at a rate less than that at which the city could manufacture it. The power companies held out for this feature of the contract in the belief that if they could supply the excess power cheaper than the city could make it they should be given opportunity to do so by contract and thereby satisfy the bondholders.

As a counter proposal the Public Service Commission drafted a tentative contract providing that the city purchase from the two companies for ten years all the electric energy needed in excess of that generated by the aqueduct plants and the steam plant of the Los Angeles Gas & Electric Corporation in case the latter plant is purchased and that for these ten years the city shall buy at least 25,000 hp. from the companies on the sliding scale of prices determined by Prof. W. F. Durand, city consulting engineer.

It was further proposed that during these ten years the city, at the demand of the companies, should sell its excess power at a price to be fixed by the State Railroad Commission and that the city should buy all the extra energy needed from the companies at prices to be fixed by the commission. Subsequently the City Council approved this contract as drawn up tentatively by the Public Service Commission.

Still later reports from Los Angeles state that after further meetings of representatives of the city and the power companies there was agreement on further minor amendment of the proposed contract. The representatives of both sides were then of the opinion that these amendments would make the contract acceptable. The next step will be to arrange a vote by the people on the proposal to issue $12,000,000 bonds.

NATIONAL CONDUIT & CABLE COMPANY FINANCING

Issues of $5,000,000 Bonds and 250,000 Shares Without Par Value Are Offered—Proportion of War Orders Small

An offering of securities of the National Conduit & Cable Company has been made in New York. Heretofore the stock of this company has been held closely.

Through the National City Company and Montgomery, Clothier & Tyler $5,000,000 of ten-year 6 per cent sinking fund first mortgage bonds were offered. The bonds will have a sinking fund of 2½ per cent. After 4 per cent is paid on the stock 50 per cent of excess earnings will be used to retire bonds. Millett, Roe & Hagen and Pritchitt & Company have offered 250,000 shares of no par value at $35 per share. It is expected that 4 per cent dividends will be paid on the new stock in the near future.

This company was started in 1888 with an investment of $4,000. Net earnings in 1915 were about $2,000,000 and in 1916 about $3,000,000, while for 1917 they are estimated at about $4,000,000. The new company which is to be formed to acquire the business will have assets of $13,500,000, of which $8,000,000 will be quick. At no time have war orders exceeded 8 per cent of the gross business.

Harrison W. Craver Appointed Librarian of United Engineering Societies

Harrison W. Craver, chief librarian of the Carnegie Library of Pittsburgh since 1908, resigned on April 1, in order to become director of the library of the United Engineering Societies of New York.

CENTRALIZED HYDROELECTRIC SUPPLY MAKES LOWER RATES

Experience of Central Maine Power Company, Which Serves Thirty Municipalities, Shows Advantage of Large-Scale Operations

The service of the Central Maine Power Company has been extended lately into the Brunswick-Bath district, following the approval of the Public Utilities Commission of the company's request to be allowed to acquire control of the Bath & Brunswick Light & Power Company. At the hearing before the commission the advantages of centralized hydroelectric development were discussed.

Harvey D. Eaton, president of the Central Maine company, stated that each of the additions to the system had resulted in some enlargement of the field for power distribution and in some cases in additions to the company's power resources. At present the company is carrying important undeveloped power resources, and it seeks a market through which it can increase its business and lower its costs of supply.

The company now serves about thirty municipalities in five counties and has developed about 12,000 hp. of hydroelectric energy and about 5000 hp. in steam facilities. On account of restricted business the Bath & Brunswick company could not materially reduce its rates, and it was estimated that a physical connection between the two properties would result in saving about $18,000 per year in water previously wasted over the dam at the Brunswick plant.

LARGE WATER-POWER DEVELOPMENT FORECAST

Walter S. Wyman, general manager of the Central Maine company, said that the company's policy has been to develop business without constructing additional plants, making the most of existing steam and water-power stations; but that the next step is to get enough business so that a large water power can be developed, say 15,000 hp. or 20,000 hp., on the upper Kennebec River. If this can be done, both costs and prices can be reduced.

"Our scheme is to develop our water powers to a point where we have to use considerable steam before we make a hydraulic development," said Mr. Wyman, "so that when we make it we will have some income by shutting down that steam. We will have some income to support that development the first year. If we start out and build a million-dollar plant and don't have any business for it, there is an interest charge of some $75,000 or $100,000 added, and our scheme is to build up that load until we have $50,000 or $75,000 of business running on steam.

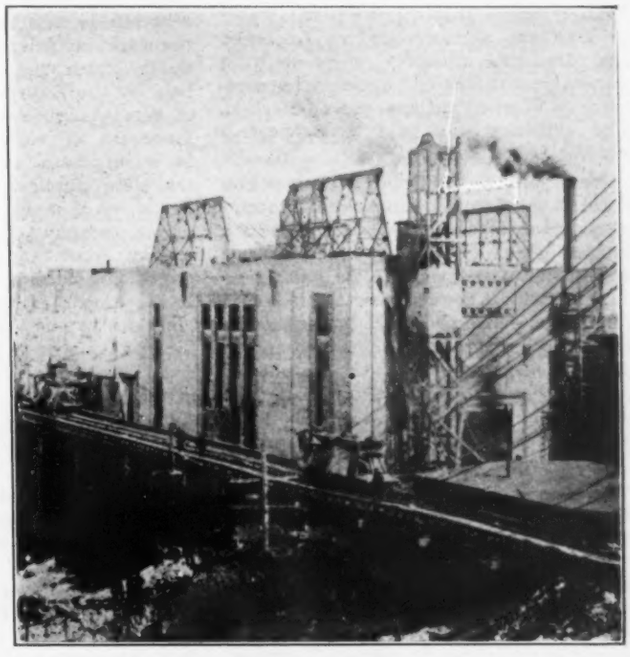
"About 25 miles of 33,000-volt transmission lines, costing about $40,000, were involved in the extension of service into the Bath territory."

Mr. Wyman said that as a result of the company's taking in local properties rates had been reduced in many communities. In Dexter, Maine, the maximum rate was 14 cents per kilowatt-hour, which has been cut to 12 cents for the first hour's use, 10 cents for the second and 5 cents for all in excess of this. The power rate was 5 cents flat, but now the iron and woolen mills in Dexter purchase power for 1.85 cents. The rates were materially reduced in the Augusta district, in Skowhegan and Bingham.

DEDICATION OF WISSOTA DAM AT CHIPPEWA FALLS, WISCONSIN

Hydroelectric Project of Wisconsin-Minnesota Light & Power Company Generates 45,000 Hp. and Furnishes Energy for Twin Cities

With the dedication of the new Wissota dam on the Chippewa River, 2 miles above Chippewa Falls, Wis., the Wisconsin-Minnesota Light & Power Company, of which J. H. Brewer of Grand Rapids, Mich., is the president, has completed a hydroelectric project that provides 45,000 hp., next in size to the Keokuk dam. More than 1000 men have been employed constantly on the construction of the dam since October, 1915.



NEW WISSOTA DAM

City officials from Eau Claire and Chippewa Falls, members of civic associations from these cities, and 200 employees of the Wisconsin-Minnesota company attended the dedication. A banquet was served in the dining hall at Wissota, at which President Brewer was the principal speaker.

MERCHANDISING COMMITTEE FOR CONTRACTORS' ASSOCIATION

National Organization Forms Body to Consider Problems of Vital Interest to Members Who Have Retail Electrical Stores

A merchandising committee of the National Electrical Contractors' Association has been appointed by Col. Robley S. Stearnes, the president. Its work will be to solve problems which are of vital interest to the members of the association who have retail electrical stores. The members are:

George Weiderman, New York, N. Y., chairman; W. G. Reuter, Cincinnati, Ohio; L. W. Cleveland, Portland, Me.; A. L. Swanson, Evansville, Ind.; Carl Heilbron, San Diego, Cal.; Rush Brothers, Hot Springs, Ark.; Robert Nickles, Madison, Wis.; E. T. Borden, Houston, Tex., and Edward Kunkle, Davenport, Iowa.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Ill-Health Resulting from Stagnant Back-Water.—In an action against the Towaliga Falls Power Company for injury, sickness, loss of time, etc., caused by stagnant back-water the Court of Appeals of Georgia held (91 S. E. 442) that evidence that pond caused water to stagnate and mosquitoes to breed and produced offensive odors showing general conditions of pond and not necessarily local conditions was admissible. The evidence was held to support a verdict for the plaintiff.

Negligence.—Evidence in an action for the death of a lamp trimmer employed to lower large suspended arc lamps, wipe off the glass globes and renew the carbon pencils, he having no duty to inspect the wires or to test them for the presence of leaks, sustained the jury's finding that he was killed by an electric shock and that the defendant was negligent in not taking sufficient precaution to secure the wires to a cross-arm, it was held by the Supreme Court of New York in Bishop vs. Kingston Gas & Electric Company (162 N. Y. S. 1097).

Duty of Utility to Supply Customers.—The broad question of how far a utility company can be reasonably expected to open its service to undeveloped and new territory received the consideration of the Supreme Court of Errors of Connecticut in the case of the New Britain Gaslight Company vs. Root (99 A. 559). The court held that a gas company should not be required to give enlarged service at a considerable cost where the prospects of return for many years are so meager as to be out of proportion to the cost, but, in the exercise of rights essentially monopolistic, it cannot withhold desired service until it promises immediate adequate return. Whether a gas company should be required to extend its mains to give service to individuals depends upon the test whether it should reasonably be called upon to give such service and not whether the service will be remunerative. A mere showing that the petitioner lived in a growing community, that it might fairly be assumed that the users of gas would materially increase, that the community lies between two cities in the direction of the natural growth of one of them, and that introduction of gas would contribute to increase the population, and thereby increase consumers sufficiently to make the proposed extension ultimately profitable, is insufficient to warrant the court in passing on the question whether the Public Utilities Commission was justified in making an order granting an extension of service to the community concerned.

Double Taxation.—That a gas company has already paid a license tax does not prevent the governing body of the municipality investigating the business for the purpose of imposing a proper tax; for, as the municipality could increase or diminish the tax, the imposition of a new tax would not amount to double taxation, it was held by the St. Louis Court of Appeals (191 S. W. 1109).

Removal of Poles Interfering with Highway Improvement.—It is the duty of a telephone company occupying a public highway under a franchise from the county court to remove and reset its poles and lines at its own expense, when notified to do so, if they are so situated as to interfere materially with the work, lawfully prosecuted, of permanently improving such highway, it was held by the Supreme Court of Appeals of West Virginia (91 S. E. 350). The franchise of such telephone company is subordinate to the rights of the traveling public in the highway. The pendency of a suit brought by the telephone company simply to enjoin the county court and its contractors engaged in making permanent highway improvement from willfully and wantonly destroying its poles and wires, and the granting of a temporary injunction order restraining such willful trespass, is no impediment to the right of the county court to apply for a writ of mandamus to compel such telephone company to remove its poles and lines.

Validity of Debt.—A corporation in which the defendant was interested was indebted to the Alabama City, Gadsden & Attalla Railway Company for motor rental, lights, etc., and at defendant's request the plaintiff removed his motor and installed it at defendant's new mill upon his promise to pay the old debt of the corporation in installments. The Supreme Court of Alabama held (73 S. 494) that such a debt became existent as a condition precedent to the removal and installation of the motor in the new mill. In assumpsit to recover amount due for electric energy and rental on the motor, testimony as to the failure of the new mill to run at certain times was properly excluded, the failure not being shown to be due to any fault of the power company or non-compliance on its part with its duty to furnish energy. Since a written contract governed the charges for energy and provided for the measurement of energy and for the determination of the reasonableness of the measurement should the meter charges appear to be excessive, the method prescribed by the contract was held to be the only method that could be used to dispute the meter reading and compute the charges. If the defendant promised to pay the old debt, his termination of the contract for energy at the new mill did not relieve him from the obligation to pay such debt when the amount thereof became due. Where energy was furnished to the defendant and he was bound to keep the motor in good condition, he was liable for excess energy used owing to his failure to keep the motor in proper condition.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Deposit Rule Under Discussion in Pennsylvania.—Conferences of various classes of public utilities have been held recently with the Public Service Commission of Pennsylvania on a general rule for deposits of consumers.

Value for Purchase.—Value for purchase is discussed by the Illinois Public Utilities Commission in a decision relating to the Illinois Terminal Railroad. "Should a regulatory commission," it asks, "give its approval to the sale of a utility property at a sum greater than that found to be the true present value of the property for purposes of rate fixing? Should it do so, and the property later become the subject of a rate inquiry, the higher value thus set by the commission for the purposes of sale and purchase may become the subject of adverse criticism. On the other hand, to deny the sale of the property to a bona fide purchaser at such price as he is willing to pay may appear to work an injustice to him and constitute an interference with his proper pursuit of business. This commission, among others, has heretofore recognized the difference between the value of a utility when used as a basis for fixing schedules of rates and when it is made the object of a sale or purchase. The allowance of a higher value in the latter case may easily be justified upon the ground that a prospective purchaser may be satisfied with a smaller return upon his money than he may believe the commission would allow him in a possible future rate-making inquiry; he may foresee greater possibilities of development in the property than do the present owners; or, for various other reasons which he may not be bound to disclose, he may be willing to pay a sum for the property that is greater or less than the value placed by a commission in a rate-making proceeding. Certain it is that a commission should do all in its power to encourage the legitimate growth of all business enterprises. Whenever, then, the restrictions which may be placed by a regulatory commission upon a property furnishing a public service are well understood, these limitations form a proper source of consideration for a prospective purchaser. And when such commission may have set a price at which such sale or purchase may be consummated, even though this price may be reasonably in excess of that value determined in a rate-making inquiry, then has its full duty been done; for notice has been served upon both parties to the transaction of the reasonable judgment thereon of impartial persons having full and complete knowledge upon all phases of the matter."

Opposition to Electricity for Taking Animal Life.—The Humane Society of Kansas City, Mo., publishes notes opposing the use of electricity for taking animal life. President Edwin R. Weeks wrote an introduction to a number of letters from teachers of physics and electricity, physicians and electrical engineers who do not approve of animal electrocution.

Chippewa Falls Power for Northern States Power Company.—The Wisconsin-Minnesota transmission line extending from the Chippewa Falls development of the Wisconsin-Minnesota Light & Power Company to Minneapolis has been placed in operation. This enables the Northern States Power Company to secure a large amount of energy, under a favorable contract. Substantial operating economies will be effected through the reduction of steam-generated electrical energy.

Appliance and Power Business Growth in Brooklyn.—The Edison Electric Illuminating Company of Brooklyn reports a 61 per cent increase in power business in the first two months of 1917 over the corresponding two months of 1916. The total horsepower amounted to 6734 as against 4194 hp. in 1916. Included in these figures are fifteen isolated plants and steam engines replaced by Edison service. The appliance business of the Brooklyn Edison company for the first two months of 1917 also showed a marked increase. The percentage increase in gross sales for these two months in 1917 was 34 per cent over the corresponding two months in 1916. The number of articles sold during this period in 1917 was 1769, against 1081 in 1916, an increase of 63 per cent. The wattage of appliances sold during the same period was 312,000, or 30 per cent better than in 1916. These increases were general throughout most of the different classes of appliances with a few exceptions.

Cost of Keokuk Power in St. Louis.—The Union Electric Light & Power Company of St. Louis is advertising as "The Electric Company" a series of "electric service editorials." One is on "How St. Louis Got Keokuk Power." It says that the North American Company has never owned more than a very small minority interest in the Mississippi River Power Company. The advertisement adds: "The Mississipi River Power Company contracted to deliver to the Mississippi River Power Distributing Company (organized by the North American Company for that purpose and later absorbed by Electric of Missouri) 66,000 hp. of energy at $16.34 per horsepower-year, or a total annual sum of $1,078,200. The power company's prospectus, issued early in 1908, declared that company's belief that 200,000 hp. of hydroelectric energy could be developed and delivered at a total plant cost of $18,546,582. Its engineers' cost estimates were too low. Thus far the power company has been able to develop only about 100,000 hp., at a plant cost several millon dollars above $18,546,582. Including an estimated—but not yet paid—fair return to the stockholders in the Keokuk plant, the actual cost to the power company of producing and delivering energy to Union Electric's transformer station at Page Avenue is $6.42 per horsepower-year higher than the rate at which Union Electric buys it, and is higher than the rates at which the Union Electric sells it to large St. Louis industries."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Colorado Power Company New Directors.—The following new directors have been elected by the Colorado Power Company: Charles J. Paine of Boston; C. N. Mason, vice-president of the Electrical Securities Corporation; Edward D. Page of New York and George E. Claflin, vice-president of the Electric Bond and Share Company, to succeed A. C. Bedford, I. W. Bonbright, J. R. McKee and Frederic C. Walcott.

New Jersey Utility Bond Law Vetoed.—Governor Edge has vetoed Senate Bill No. 170, introduced by Senator McCran, Passaic, providing that public utility companies operating in the State should not be required to obtain authority from the Board of Public Utility Commissioners to issue stocks, bonds or other securities for work and expenditures outside of the State. The veto says that while the Governor is in sympathy with the purpose of the proposed law to limit the jurisdiction of the board over the issuance of stock and bonds of utility companies to their property in New Jersey, the plan is not a practicable one.

Public Utility Bonds for Savings Bank Investment in Maine.—Maine has amended the law so as to include certain bonds of public utility corporations not heretofore recognized as legal for investment. The amendment provides that savings banks may invest in the first mortgage bonds of any public service corporation located wholly or in part in States other than Maine (New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, Maryland, Ohio, Indiana, Kentucky, Michigan, Wisconsin, Minnesota, Iowa, Illinois, Missouri, Kansas and Nebraska) engaged in producing and distributing electric light and power when they otherwise comply with provisions specified, provided that the average gross income for three years next preceding such investment shall have been not less than $200,000 each year, and the average net income for the same period shall have been not less than twice interest charges on bonds outstanding secured by such mortgage and all "prior liens," and further provided that such net income for the last preceding year shall have been not less than one and one-half times the interest charges on all the interest-bearing indebtedness of the corporation.

Ohio State University Engineering Students Off on Inspection Trip.—On March 29 forty-five electrical and mechanical engineering students of the Ohio State University, Columbus, left on a special car for an inspection of a number of manufacturing plants. In Pittsburgh on the following two days they visited the plant of the Westinghouse Electric & Manufacturing Company and other industrial establishments. Other plants to be visited included power stations and factories at Niagara Falls and the General Electric Works at Erie, Pa.

Advertising Hydroelectric Energy on a Window.—Mapping its transmission lines on glass, the Central Maine Power Company calls attention to the magnitude of its hydroelectric system on the front of its main office window in Augusta, Me. The high-tension lines are shown in red and gold bands ¾ in. wide, rivers, lakes and the coast line bounding the company's territory on the east being shown in blue. The map occupies a space about 5 ft. wide by 8 ft. high, and the location of the company's power plants and substations is precisely indicated, as well as the watercourses.

Receivership of Northern Idaho & Montana Power Company.—By agreement of the company and its creditors the Northern Idaho & Montana Power Company has been thrown into a receivership by the federal court. Elmer Dover has qualified as receiver. This company operates light, gas, water and telephone systems in thirty-five towns in Idaho, Montana, Washington and Oregon. The complaint says that the company has outstanding $4,715,500 bonds, that it had been compelled to borrow money to meet the interest payments, that the expenditure of $300,000 for new apparatus and plants is necessary and that the money cannot be secured under the conditions at present existing.

Smoke Abatement Succeeding at Boston.—In the four years ended Nov. 30, 1916, the number of recorded observations on stationary boiler plant stacks in the Boston district increased from 27,423 to 60,243, according to the latest report of the Massachusetts Gas and Electric Light Commission. Despite the adverse fuel conditions of 1916, excessive smoke was noted in but 704 of the above cases by the board of inspectors, compared with 930 in 1913. The percentage of observed violations fell during the period from 3.3 to 1.2 in stationary stacks. Of the stationary stacks recorded observations were made on 123 public service plant chimneys, 661 manufacturing plants, 502 office buildings and 11 residences. The number of stacks showing excessive emission was: Public service, 26; manufacturing plants, 178; office buildings, 67. All public service stacks on which violations were checked had remedied their conditions at the end of the year. The report of the smoke inspection department refers appreciatively to the difficulties under which plant owners and operators have labored with respect to fuel supply.

Niagara Falls Section, N. E. L. A.—Arthur Frederick Sheldon of Chicago spoke on "Where I Am and Where I Wish to Be" at a meeting of the Niagara Falls Section of the National Electric Light Association held on March 30.

Pittsfield Electricians Hear Lecture on Transformers.—Thornton Victory of the engineering department of the General Electric Company gave an interesting lecture on transformers in Pittsfield, Mass., March 28, before members of the Electrical Workers' Local 496. Slides of the large transformers which the General Electric Company is putting on the market were shown.

Radio Club of America.—Dr. H. O. Taylor, research engineer of the National Electric Signaling Company, presented a paper on "Motional Impedance Circle of the Telephone Receiver" before the Radio Club of America in New York on March 23. He explained a method of greatly increasing the efficiency of the telephone receiver by properly tuning the natural periods of the diaphragms.

Officers Minnesota Electrical Association.—The following officers were elected to serve the Minnesota Electrical Association for the coming year: President, Fred A. Otto; first vice-president, D. J. Fleming, Red Wing; secretary-treasurer, H. E. Young, Minneapolis; executive board: Fred A. Otto, St. Paul; R. M. Howard, Winona; H. E. Swanson, Rochester; T. C. Gordon, Little Falls, and H. E. Young, Minneapolis.

Coming Meeting of Minneapolis Jovian League.—The Minneapolis Jovian League will meet on April 12 at the main engineering building of the University of Minnesota. The program will include a motion-picture film, "King of the Rails," showing pioneer as well as present-day methods of transportation up to the electrification of the Chicago, Milwaukee & St. Paul Railroad over the Rocky Mountains. Other views will also be shown.

Pittsburgh Section, A. I. E. E.—"Voltage Regulation of Large Transmission Systems" will be the subject of the meeting of the Pittsburgh Section of the American Institute of Electrical Engineers to be held April 10. Short, original illustrated papers will be read by E. C. Stone, system operator of the Duquesne Light Company; J. E. Thomas, system operator of the West Penn Power Company, and H. L. Fullerton, electrical engineer of the Duquesne Light Company.

Engineering Society Presidents Speak at Brown University.—Three engineering society presidents addressed the monthly meeting of the Providence Engineering Society, held March 28 at the Arnold Biological Laboratory, Brown University. Ira N. Hollis, president of the American Society of Mechanical Engineers; George H. Pegram, president of the American Society of Civil Engineers, and Harold W. Buck, president of the American Institute of Electrical Engineers, were the speakers, the general topic being "The Engineer and Organization."

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 687 of this number.

Steam Railroad Electrification.—W. T. Whalen of the railroad department of the Westinghouse Electric & Manufacturing Company gave an illustrated lecture on "Steam Railroad Electrification" before the Detroit Engineering Society on March 9.

Institute of Radio Engineers.—The Institute of Radio Engineers held a meeting on March 4 in the Engineering Societies Building in New York City. Dr. F. H. Millener of the Southern Pacific Railroad presented a paper on "Radio-Telephony." This paper described the radiophone work undertaken by Dr. Millener for railroad communication.

Export Situation Discussed Before St. Louis Jovians.—D. S. Kramer, head of the export department of the Century Electric Company, who has recently returned from an extended tour of the world, addressed the St. Louis Jovian League at the Mercantile Club on March 27. One of the important points he made was that the low-price German and English electrical apparatus and appliances exported into some countries is of a very inferior and unsatisfactory grade, and though it may meet temporary success will not permanently satisfy. He advised American manufacturers to refrain from attempting to compete with European manufacturers in low-grade goods, and to attempt to establish a trade for reliable products. Once a reputation for reliable products is established trade expansion will result, he declared. R. J. Russell, secretary of the Century Electric Company, presided as chairman of the meeting.

Westinghouse Employees Hold Annual Dinner.—Nearly 500 Westinghouse employees attended a dinner on March 24, in the English Room of the Fort Pitt Hotel, Pittsburgh, under the auspices of the Westinghouse Club. The first speaker of the evening was E. M. Herr, president of the Westinghouse company. He praised the loyalty of men who have been with the firm for years. Farley M. Osgood, vice-president and general manager of the Public Service Electric Company of New Jersey, called attention to an interpretation put on the term "engineering," saying that it means 90 per cent horse-sense and the rest horse-sense. In addition, he pointed out that engineers are becoming better recognized publicly as shown by the selection of the five principal engineering societies to compile data on the manufacturing facilities of all industrial plants. A "Challenge to Engineers" was the subject of an address by Rev. Daniel L. Marsh.

New England Section, I. E. S.—M. Luckiesh will speak on "Linking Science and Art with Practice in Lighting" before the New England Section of the Illuminating Engineering Society on April 11, at the Massachusetts Institute of Technology, Cambridge, Mass.

Westchester Lighting Company Section, N. E. L. A.—The second regular meeting of the Westchester Light Company's section of the National Electric Light Association was held in Mount Vernon, N. Y., on March 21. The speakers were as follows: H. M. Brundage, assistant secretary Consolidated Gas Company of New York; W. L. Secord, new-business manager Westchester Lighting Company, Mount Vernon, and C. F. Bryant, auditor Westchester Lighting Company. Mr. Secord spoke about employees' benefits derived from N. E. L. A. membership. He mentioned the various activities carried on through the monthly bulletin, and the great educational advantages to be derived from its pages. Mr. Brundage spoke about "Personal Initiative" in business. He said that the best way an employee can show and develop personal initiative is by working for some particular object, as well as by taking advantage of the many educational opportunities offered to-day which were unheard of ten years ago.

A. I. E. E. Annual Convention.—Five technical sessions have been decided on tentatively for the annual convention of the A. I. E. E., to be held at Hot Springs, Va., June 26-29. The convention will open on the afternoon of Tuesday, June 26, with president H. W. Buck's address, followed by reports of the various technical committees. The transmission and distribution committee will have charge of the two sessions on Wednesday. The morning will be devoted to the subject of high-tension cables. Three papers will be presented thereon as follows: "Certain Insulation Characteristics of High-Voltage Cables," by W. S. Clark and G. B. Shanklin; "Problems in Operation and Maintenance of Underground Cables," by John L. Harper; "Fundamentals of High-Tension Cable Joints" by D. W. Roper. The afternoon session will be devoted to high-tension insulators, and four papers will be delivered, as follows: "The Insulator Situation," by W. D. Peasley; "Porosity of Electrical Porcelain," by H. J. Ryan; "Expansion Effects as a Cause of Deterioration in Suspension-Type Insulators," by J. A. Brundige, and "Present Practice in the Design and Manufacture of High-Voltage Insulators," by A. O. Austin. The morning of Thursday, June 28, has been designated as the mining session and the following papers will be presented: "Forms of Power Best Suited for the Various Loads Encountered in the Operation of Bituminous Coal Mines," by R. L. Kingsland, and "Test of a Large Mine Hoist," by R. S. Sage. The fifth and last technical session, which will be a railway session, will be held Friday morning, June 29. Preparations for the convention are rapidly being completed, and a very large attendance is indicated.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

James Walter Gillette, who has been made general manager of the Lee Light & Power Company, Clarinda, Iowa, to succeed Rufus E. Lee, was born at Burlington, Mich., on June 28, 1871. He was educated at the public schools of Kalamazoo, Mich., and Wyoming, Ohio. After a special course in drafting at the Ohio Mechanics' Institute of Cincinnati, he spent three years at DePauw University, Greencastle, Ind. Mr. Gillette's first electrical experience was with the American Hoisting & Derrick Company as draftsman. After a year of this work he became first assistant to the designing engineer of the California Electrical Works, San Francisco, and later installed a number of plants for that company. He then entered the engineering and construction business for himself in Southern California. In 1895 he rebuilt the lighting system and station equipment at Fond du Lac, Wis. The following year he became general superintendent of the

JAMES W. GILLETTE

Marinette Gas, Electric Light & Street Railway Company, Marinette, Wis., but resigned two years later to become manager of the West India & Columbia Electric Company, Barranquilla. During that time he also acted as resident engineer for the Rio Bogua Mining & Trading Company. He next headed an expedition into the interior of Antigua in company with two mining engineers. Returning to the United States he was appointed superintendent of the electrical department of the Evansville (Ind.) Gas & Electric Light Company. In 1902 he became resident engineer of the Phoenix Gas & Electric Company, Phoenixville, Pa., which included the gas works, electric-light station and street railways. He later went with the Fort Smith (Ark.) Light & Traction Company, where he was manager for a number of years. During that time he served as president of the Arkansas Association of Public Utility Operators. Later he became manager of the Brisbane Tramway Company, going from this country to England and thence to Australia. The war having brought many changes in that country, he returned to America and accepted management of the Clarinda property.

L. A. White has been promoted from superintendent to general superintendent of the Muskogee (Okla.) Gas & Electric Company.

J. F. Owens has been promoted from superintendent to manager of the Muskogee (Okla.) Gas & Electric Company, succeeding H. C. Hoagland.

W. R. Emerson, secretary and treasurer of the Muskogee (Okla.) Gas & Electric Company, has been appointed assistant manager of the company.

N. I. Garrison, formerly auditor of the Fort Smith Light & Traction Company, has been transferred to the management of the El Reno (Okla.) Gas & Electric Company, succeeding F. H. Tidnam.

F. H. Tidnam, formerly treasurer, general manager and contract agent of the El Reno (Okla.) Gas & Electric Company, has been appointed assistant secretary of the Central Oklahoma Light & Power Company, with headquarters at Oklahoma City.

L. R. W. Allison, for the last five years associated with the Rice Electric Display Company, New York, has resigned, effective April 1, with the intention of engaging independently in electrical and technical writing and research work at Newark, N. J. He was formerly stationed at Los Angeles, Cal., and has been a contributor to the ELECTRICAL WORLD.

A. J. Authenreith, who has been chief engineer for the Central Illinois Public Service Company at Mattoon, Ill., since the formation of the company, and prior to that was engineer of the Mattoon Electric Light Company, has been appointed chief mechanical engineer of the Middle West Utilities Company, Chicago, Ill., in charge of the engineering of the company's ice plants and waterworks.

James M. Barry, chief of the department of electricity at San Francisco for the last three years, has resigned to take a position with the Great Western Power Company as engineer of distribution. Mr. Barry had charge of design in connection with the building of the Northwestern Electric system in Portland, Ore., which is also controlled by the Fleishhacker interests, and the offer of the position with the San Francisco properties comes as a result of his work with this company in the North. The Great Western plans a number of extensions in San Francisco, Oakland and Sacramento. Mr. Barry's work will be the design and supervision of extensions to overhead and underground distribution. Arthur Kempston, now in charge of overhead construction for the city, will succeed Mr. Barry.

H. S. Foley recently left the Ebro Irrigation & Power Company of Barcelona, Spain, where he has been in charge of the distribution system and steam plants for the last three years. His subordinates presented him with a silver tablet upon which was engraved a testimonial of their affection and the names of the donors. Mr. Foley has been identified with the late Dr. F. S. Pearson's interests for the last thirteen years, ten of which were spent in Mexico City, where he was with the Mexican Light & Power Company and the Mexico Tramways Company as general superintendent of power and distribution. Mr. Foley is now connected with the Compagnie Générale d'Electricité and will in future make his headquarters in Paris, but is in this country at the present time arranging for the purchase of machinery and supplies for some of the properties which his company operates in France. Mr. Foley has been a contributor to the ELECTRICAL

H. S. FOLEY

WORLD during the past year on the subject of introducing American electrical goods in foreign markets.

Obituary

Fridolin C. Jenny, late of Zurich, Switzerland, died suddenly in New York City on March 26. He contracted a cold about a week before he died which confined him to his hotel and rapidly developed into pneumonia. Mr. Jenny was a director of the prominent engineering firm of Escher, Wyss & Co. of Zurich and was in this country on the way back from Japan, staying here for a short time in connection with his company's business. He was born October 14, 1878, and was well known in engineering circles both here and in Europe.

Rollo B. Kinsman, chief engineer of the Greenfield station of the Greenfield (Mass.) Electric Light & Power Company, was electrocuted March 25 while repairing a lightning arrester at the plant. Edward Leurkahardt, an assistant in the station, also lost his life in an attempt to rescue his chief's body.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

LARGE VOLUME OF TRADE IS CARRIED BY JOBBERS

Prices Generally Are Steadier, with Advances in Lines Employing Steel in Their Construction—Collections Somewhat Slow

Conditions in the electrical supply and jobbing field appear to be very steady, with a large volume of trade being carried. Generally speaking, the falling off in business ordinarily felt at this time is manifest, but not so acute as under ordinary conditions. Buying, however, for future deliveries is being placed a little further ahead than ordinary, tending as a result to smooth out hollows in the sales curve. In New England a slight recession in the volume of business is noticeable at present, particularly in relation to building installation equipment. On the whole, there appears to be a little diminution in orders, chargeable to the prospect of a vigorous war between the United States and Germany. There is also a particularly noticeable demand for electric motors for industrial service, owing in a large measure to the increased price of coal in this region. It is also noted in New England that preparedness measures have increased the sale of flood-lighting equipment and that the demand for electrical flags is increasing. In the Northwest buying or ordering is about the same as reported for the previous months of the year and is about normal. There is a noticeable increase in this section in purchasing of some material, especially in those lines used for shipbuilding, this industry being very active throughout the Northwestern territory. Building construction appears to show a satisfactory advance over last month.

There seems to be a feeling among the Middle Western jobbers that the demand for goods eased up a trifle during March and that the month of April will see a very active business in spring construction materials. With the possible exception of what may be termed the spring buying habit, "wire your home time" is looked upon in the Middle West as the greatest single factor by those who are anticipating a spring construction rush. Lamps throughout the Middle West continue to be in good demand and are still very difficult to obtain. Throughout California and the Southwest there has been a considerable office and residence building construction in the past month, sufficient to bring this line of business up to a higher level than the volume of industrial business reported as favorable for the earlier part of the year.

In the East and South conditions are about normal, with a continued large demand around New York for construction materials, particularly for factory construction. There has also been recently in the Middle Eastern States a very noticeable demand for electrical materials from utilities for new construction work. In the South, however, it has been noted that the high prices of building materials, particularly the price of copper, has caused many of the smaller utilities to abandon for the time being plans for additions and betterments. In a number of cases, it has been pointed out, communities which had anticipated building lighting plants have, because of the higher prices, been forced to defer actual construction work while these conditions prevailed. This same condition is known to hold good where extended improvements in electrical equipment have been planned.

On the whole, prices for electrical equipment continue to advance, particularly in those lines where steel and copper enter. Iron conduit is much higher, and practically all lines using steel have advanced. With few exceptions there have been no noticeable advances in materials employing brass. In the Southwest prices are more stable than last month, there being fewer changes, but those changes which did occur were all increases. The same holds true for the Middle West, where the particular lines which have increased lately were steel and copper products. Some jobbers in the Middle West are expecting higher prices for copper in the future. In the Northwest a sharper increase in prices is noted by the large supply houses as compared with the preceding months of the year. The upward trend is particularly noticeable over prices for February. On March 8 new prices on several different lines became effective. New England jobbers forecast further advances in prices, especially in lines of equipment which would tend to move more rapidly in the event of hostilities. In the East and South prices are becoming somewhat steadier, but there are still advances in certain lines, particularly those using iron and steel in their manufacture.

Jobbers' stocks throughout the country are from normal to large. Deliveries, of course, have been an important factor in this connection. It has been generally true, though, that stocks of construction material are particularly large right now. In this connection it has been noted that jobbers' stocks of line hardware are in a very favorable condition. In New England the problem of securing deliveries is becoming still more acute, and manufacturers are urging distributors of electrical equipment to do whatever they can to postpone deliveries. The demand for standard equipment is being filled by manufacturers to the best of their ability, but inquiries and orders for special equipment stand little chance, it is stated, of early consideration at present. Throughout the Atlantic States and the South stocks are generally larger than they were before the war, although there is still some difficulty in obtaining certain lines of equipment. Broadly speaking, the stocks of the Middle West are about normal, but even those which are below normal are heavily supplied with construction material. Orders that were placed many months ago are now being filled and helping out to a large extent. Large stocks are reported by some jobbers of pole-line material, these stocks having been ordered many months ago. Other jobbers, however, who have not large stocks of this material, it is understood, have bought heavily on sockets and wiring devices and will be able to supply heavy demands for this class of goods.

In California and the Southwest the condition of stocks remains about the same. There is recognition on the Pacific Coast of the likelihood of being unable to get deliveries in the event of factories being tied up with government orders, but this likelihood is not given weight enough to warrant placing larger orders and thereby taking greater chances of loss that would attend the decrease from the present abnormal high prices of materials. Some of the larger dealers in the Northwest report a few lines as being easier to obtain than during the past two months, but they are so few that they scarcely deserve mention. Factories report extreme difficulty in securing materials with which to manufacture. Several large concerns months ago placed orders and to-day are carrying exceptionally heavy stocks, particularly in the hardware line.

In spite of the fact that war has been declared, the outlook by jobbers is optimistic. While the classes of electrical goods sold may change somewhat because of the war, it is felt by well-informed observers of jobbing conditions that the outbreak of hostilities will soon be followed by intense productive activity which will spell extremely busy times for the wholesale distributor. Reports from the Pacific Coast show that jobbers there will continue to hew close to the line in placing orders only for the volume of business which they feel that they are fairly certain of transacting.

Collections are good in some sections of the country but poor in others. Where they are poor it is generally felt

that the entrance of this country into the war will bring so many uncertainties that creditors are holding up payment. In the larger centers in New England credits and collections are about normal, but in smaller jobbing centers it is reported that collections are a little slow. Generally, credits and collections are still good in the Middle West, but a few jobbers report that collections are a trifle slower owing to the uncertainty created by the international situation. The same is true of the Southwest. In contrast to this, however, the conditions on the Pacific Coast are extremely good, owing, it is understood, to a better extension of credit. Collections are uniformly excellent in this section of the country.

WAR PRESENTS MOMENTOUS PROBLEMS TO MANUFACTURERS

Trade Supremacy in the Markets of the World Now Held in the Balance, with Labor Playing Important Rôle

War has been declared, and the industries of the nation are now face to face with what are probably the most momentous problems ever presented to a people. A false step made at this time may set American industries back many years in international trade. Patriotism, which now runs high, is apt to deaden for the moment the far-sighted business sense of many manufacturers. Some of the more level-headed ones are counseling carefulness.

Already contracts for shells amounting to many millions of dollars have been awarded to and accepted by a prominent electrical manufacturing company. Fortunately this order can be apportioned by this company in its various shops so as not to cause any embarrassment in production. However, should electrical manufacturers generally rise to this bait of war orders under the lure of patriotism with the same or greater eagerness than that with which they accepted contracts from Europe in 1915, the result would be a paralysis in the market for goods other than those intended for war use. Already electrical factories are congested with legitimate orders for apparatus badly needed by both the electrical and non-electrical industries of this country.

There is a large market for electrical material, and while electrical manufacturers should assume their share of the government's needs it would be folly to jeopardize future business by clogging the works right now with war contracts. Europe has wisely farmed out as much of the business in war materials as possible, giving home factories an opportunity to regain their foreign trade.

While the President's call for a declaration of war was for humanity's sake, underneath the entire world situation is another war of far greater significance, namely, world industrial and commercial supremacy. If American goods are to be a factor in the greatest commercial struggle that has ever taken place, then it is evident that the American factories must be prepared to turn out goods in the volume demanded and at the time wanted.

In addition, the advent of war opens a serious situation in regard to labor, and the solution will rest largely with the manufacturer. American labor will be quick to enlist unless there is some restraining hand. If manufacturers are to serve the government in her time of need, if American goods are to be a factor in the world commercial struggle, then the skilled labor of America must be kept in the shops. Producers are more valuable producing goods than fighting in the trenches.

To the electrical manufacturers there is unusual significance in the action of other manufacturers. Foreign trade in electrical goods is not large, but the sale of electrical goods to those shops making other goods for export is large. Should the other manufacturers not be in a position to take their place in the world's trade because of shop congestion, electrical manufacturers will suffer accordingly.

The economic life of the nation is now at stake, and the subsequent action of American manufacturers will determine to what extent the United States will retain after the war the grip which it now holds on the markets of the world.

FOREIGN TRADE IS BRISK IN LIGHTING FIXTURES

Despite Troubles with Transportation and Communication Facilities Business Is Good—Healthy Growth Is Expected to Continue

Manufacturers of lighting fixtures with plants in the Middle West report that business with foreign countries during 1916 and the early part of 1917 was exceptionally good. With the restoration of normal transportation and communication facilities the majority of men in this branch of the trade see a real boom so far as foreign business is concerned. In summing up the situation as regards his company one large manufacturer said: "During the year 1916 we enjoyed the best foreign business that this company has ever known, and during the first two and one-half months of this year we have received some very nice foreign contracts. If conditions remain the same as they are at the present time, we look for even a bigger year in foreign business in 1917 than we had in 1916."

While there are here and there some who have "fears" of various kinds, it seems to be the general impression that export business is good, will become better with improvement of freight, mail and telegraphic conditions, and will be very good for at least a few years after the end of the war.

From other companies there come reports of equally successful foreign ventures, sprinkled with anecdotes of certain widely advertised fixtures in the palaces of Oriental dowagers, extraordinarily favorable contracts with Scandinavian agents, etc. Occasionally a company reports failure to profit on foreign business. This is especially true where small companies maintain independent foreign agents.

COPPER MARKET QUIET WITH QUOTATIONS EASIER

Uncertainty Regarding Effect of War on Business Generally Prevents Any Active Offering or Buying

Owing to the prevailing uncertainties regarding the effect on business generally of the entrance of the United States into the war, the copper market during the past week has been very quiet, and prices have eased off a cent or more. There has been no activity in the market in any direction that would tend to show whether higher or lower prices are anticipated. In electrical circles there is a very definite feeling that actual prices will not only not be lower, but that higher prices will prevail soon. This feeling is based on the amount of work now in progress and on the books, and on the amount of work which there are good reasons for believing will be undertaken in the near future.

Market quotations for electrolytic on Tuesday were nominally as follows: Prompt, 34 cents; May, 33.25 cents; second quarter, 33 cents; third quarter, 30.25 cents; fourth quarter, 29.25 cents.

NEW YORK METAL MARKET PRICES

	March 27 Selling Prices Bid	March 27 Selling Prices Asked	April 3 Selling Prices Bid	April 3 Selling Prices Asked
Copper:	£ s d		£ s d	
London, standard spot	136 0 0		136 0 0	
Prime Lake	35.00 to 35.50†		34.00 to 34.50†	
Electrolytic	34.50 to 35.50†		33.75 to 34.25†	
Casting	31.25 to 31.50†		30.75 to 31.25†	
Copper wire base	39.00 to 41.00†		39.00 to 41.00†	
Lead	9.00		9.00	
Nickel	50.00		50.00	
Sheet zinc, f.o.b. smelter	21.00		21.00	
Spelter, spot	10.80 to 10.92½		10.55 to 10.67½	
Tin, straits	56.00		54.37½	
Aluminum, 98 to 99 per cent	55.00 to 57.00		55.00 to 57.00	

OLD METALS

Heavy copper and wire	29.00 to 30.00	28.00 to 29.00
Brass, heavy	17.00 to 17.50	17.50 to 18.00
Brass, light	13.00 to 13.50	13.00 to 13.50
Lead, heavy	7.25 to 7.50	7.50 to 7.75
Zinc, scrap	7.50 to 7.75	7.75 to 8.00

†Nominal.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Instantaneous Voltage Regulator

Among recent inventions which should prove of considerable interest to central station companies employing a large number of distribution transformers is a compensating device known as the

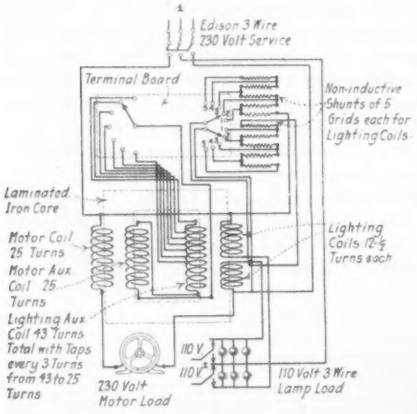

Edison 3 Wire
230 Volt Service
Terminal Board
Non-inductive Shunts of 5 Grids each for Lighting Coils
Laminated Iron Core
Motor Coil 25 Turns
Motor Aux Coil 25 Turns
Lighting Aux Coil 43 Turns Total with Taps every 3 Turns from 43 to 25 Turns
Lighting Coils 12½ Turns each
110 V.
110 V.
230 Volt Motor Load
110 Volt 3 Wire Lamp Load

FIG. 1—INTERNAL AND EXTERNAL CONNECTIONS OF REGULATOR

Schweitzer instantaneous voltage regulator. By means of this apparatus it is possible to connect single or polyphase power loads to the transformers supplying lamps and still maintain good regulation on the lighting circuits irrespective of the disturbances caused by starting motors or by variations in the loads on motors. The regulator may be mounted on a pole alongside the service transformer and connected in series with the low-voltage circuit ahead of the light and power load.

The regulator consists of two main windings, having a common magnetic circuit, one in series with the motor load and the other in series with the lighting load. On a three-wire lighting circuit the lighting service coil is divided in halves and each half is connected in series with one of the outside lighting-service wires. Two auxiliary windings, one on the same leg with the main-motor winding and the other on the leg with the main lighting winding, are employed to vary the amount of boost required to compensate for the voltage drop in the lighting transformer caused by starting of motors or variations of load on the motors. The auxiliary windings are connected in series with each other in such a manner that their induced voltages are opposed. The variation in compensation of the regulator is obtained by varying the number of turns in the auxiliary lighting coil by means of a multipoint switch. In order to reduce the impedance drop in the main lighting coil and maintain good regulation on the lighting circuits when the lighting load changes, a non-inductive variable shunt is connected across the main lighting coils. Besides reducing the impedance of the main lighting coils, this shunt also serves as an additional means for adjusting the amount of compensation of the voltage regulator.

According to tests which have been made with one of these regulators in circuit, no appreciable voltage fluctuation occurred on the lighting circuit, although it was connected to the same transformer that served some motors and a water heater. The transformer was rated at 5 kw., the heater at 750 watts, and the motors had an aggregate rating of 4 hp. and drew relatively large starting currents frequently.

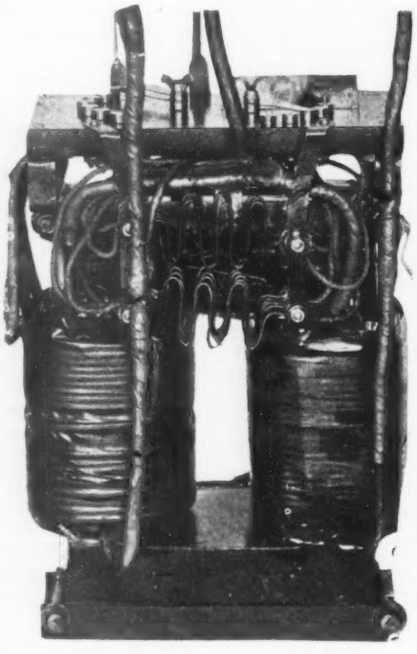


FIG. 2—CORE AND WINDINGS OF REGULATOR

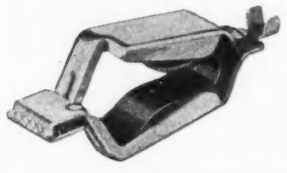
The regulator is of a core-type design, is oil-cooled and has the same appearance as a pole-type transformer. Since the regulator has no moving parts, it requires no more attention than a pole transformer when once adjusted to give correct compensation. The use of the regulator enables a saving of one transformer and the primary cut-outs where a consumer ordinarily has separate transformers for light and power. Since motor and lighting service can be supplied from a single transformer with this equipment installed, the load factor on the distribution transformer is considerably improved, resulting in a higher all-day efficiency. By the employment of the instantaneous voltage regulator it is possible to connect any size of motor to a lighting transformer regardless of the character of the motor load or motor-starting current so long as the capacity of the motor itself is within the rating of the transformer and regulator supplying the load. The regulator can be made in any size to operate on any load and with any size of service transformer. This regulator was developed by E. O. Schweitzer, chief testing engineer, Commonwealth Edison Company, Chicago, Ill.

Storage Battery

The Vesta Accumulator Company of Chicago, Ill., has developed a method of locking the plates of a battery which it claims prevents warping under heavy electrical loads. The batteries are also furnished with impregnated wood separators, which, it is claimed, prevent the formation of lead filaments in the pores of the wood and thus eliminate short circuit of the plates from this cause. The impregnating compound permits the separators to absorb the electrolyte as freely as untreated wood fiber, the manufacturer declares, so a low-resistance path is afforded inside the battery.

Test Clips

Test clips with which lighting and starting batteries may be charged without disconnecting the batteries from the car have been developed by R. S. Mueller & Company, 423 High Street, Cleveland, Ohio. With these clips it is claimed that it is not necessary to clean dirty terminals, as the teeth of the clip bite through the corrosion and make a good contact. The clips are made of lead-plated steel. The clip shown in the accompanying illustration is designed to carry 35 amp., and the jaws have a spread of 1½ in. (3.81 cm.). Other clips are made in 15-amp., 20-amp. and 100-amp. sizes. Rubber insulators for covering the clips are also furnished when specified.



LEAD-PLATED STEEL TEST CLIP

Electric Radiator

The electric radiator shown in the accompanying illustration has been developed by the Rutenber Electric Company, Marion, Ind., for use in bathrooms, offices, moving-picture cashiers' offices, and other similar places. The radiator is built in sizes rated from 660 watts to 2000 watts, according to the amount of

PORTABLE ELECTRIC RADIATOR

space to be heated. It is finished in polished nickel and is furnished with or without a control switch.

Resistance Material

Nickel-chromium alloys for electrically heated devices have been developed by the Electrical Alloy Company of Morristown, N. J. One of these alloys has a specific resistance of 600 ohms per mil-foot (1.27 ohm cir. mm.-meter), a temperature coefficient of 0 00019 deg. Fahr. (0.000006 deg. C.), and the melting point is above 2800 deg. Fahr. (1538 deg. C.). The other alloy is for use in electric ovens, electric furnaces and other applications where continuous high temperatures are required. The specific resistance is 565 ohms per mil-foot (1.20 ohm. cir. mm.-meter), the temperature coefficient 0.00009 deg. Fahr. (0.000003 deg. C.), and the melting point 3000 deg. Fahr. (1701 deg. C.).

Side-Outlet Service Tap

The Trumbull Electric Manufacturing Company of Plainville, Conn., has joined the movement for standardization of contacts in plugs, receptacles and simi-

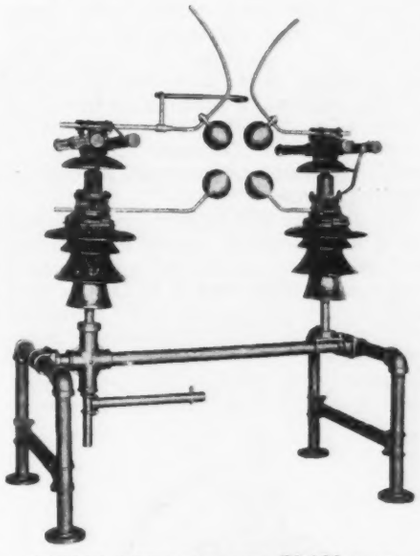
SERVICE TAP FOR SERIES CONNECTION

lar devices and has recently brought out a number of devices that are interchangeable with corresponding products of other makes of "standard" devices. In the accompanying illustration is shown a porcelain side-outlet current tap with standard composition cap. The side outlet is for series connection. Another device is a compact separable attachment plug with standard cap. This plug is made of fireproof and durable composition material.

Sphere-Gap Electrolytic Arresters

Sphere gaps have been provided on all aluminum-cell electrolytic lightning arresters made by the General Electric Company of Schenectady, N. Y., for service above 7250 volts. For lower voltages the diameter of the copper rod used to form the horn gap is so large in proportion to the gap that the effect is the same. The upper set of spheres have horn extensions to assist the arc to rise and thereby extinguish it quickly. Horns are not necessary on the lower spheres as the arc rises from them to the upper ones and is thus extinguished.

The sphere gap discharges faster for sudden impulses than the horn gap and has a shorter dielectric spark lag. These characteristics are necessary for protection against the sudden impulses of electrical disturbances, the manufac-

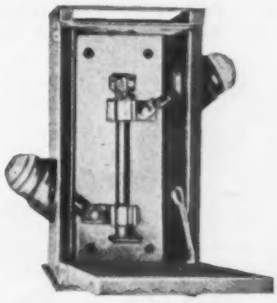


SPHERE HORN GAP FOR 70,000-VOLT ARRESTERS

turer points out. Protective gaps should be as "fast" as possible and the insulation of the other apparatus as "slow" as possible because a definite time is required to flash over or rupture all insulations, such as air gaps, surface and solid dielectrics. The time interval varies with the nature of the insulation, the shape and spacing of the surfaces or electrodes and the frequency and magnitude of the applied voltage. Differences in the dielectric spark lag, although infinitesimal, are appreciable when the rate at which the abnormal voltages can be applied is of the order obtained with lightning or similar disturbances. Because of this phenomenon attending dielectric spark lag, a voltage wave in the form of a sudden impulse may not break down what is apparently the easiest path. For example, the voltage may rise beyond the discharge voltage (60 cycles) of the protective gaps and arc over or puncture insulation having a much higher discharge test voltage.

Combined Fuse and Switch

W. N. Matthews & Brother of St. Louis, Mo., point out several improvements that are embodied in their "fu-



INTERIOR VIEW OF "FUSWITCH" FOR DISTRIBUTION CIRCUITS

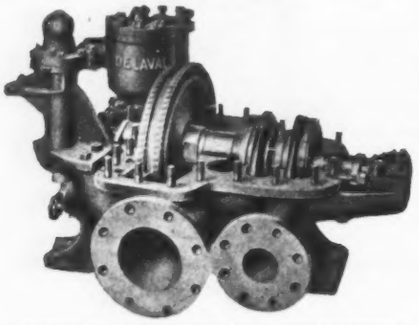
switch" shown in the accompanying illustration. The rating of the device has been increased from 60 amp. to 100 amp. The maple fuse carrier ordinarily used with such switches is eliminated and the switch blade and fuse cartridge are combined in one piece. This type of fuse switch is much lighter than types formerly made. The inclosing box has an asbestos board bottom and roof, which, it is claimed, cannot crack, warp or check as wooden roofs do. In case the switch blades are not pushed fully into the contact jaws the door will do so when opened automatically. This feature, it is claimed, also prevents the blade from jumping out of the jaws. In case an unusual explosion of the fuse occurs (as during lightning) and gases cannot get out of the bottom vent hole quickly enough, the door will fly open and automatically shut itself again, thus relieving the pressure on the box and saving it from damage. The boxes are also safer for the linemen to operate, the manufacturers point out.

Luminous Attachment for Switches

The luminous "Radieye" attachment developed by the General Electric Company of Schenectady, N. Y., for pull-socket chains and flush-plate switches shows the location of switches in a dark room by means of the luminous rays emitted from its radium composition. Since the luminant is a composition containing radium and not phosphorus, the light is permanent. No replenishing of the composition is necessary, it is claimed. The radium is protected by glass, while the attachment itself has a brass body, which affords additional protection. If used with a pull-chain attachment, the luminous indicator is substituted for the usual ball at the end of the chain. When used with a flush-plate switch the indicator is substituted for one of the screws which attached the plate to the wall.

Turbine-Driven Centrifugal Boiler-Feed Pump

A 3000-hp. two-stage centrifugal boiler-feed pump combined in one casing and on one shaft with a velocity stage steam turbine, is shown in the accompanying illustration. This unit, which has been developed by the De Laval Steam Turbine Company of Trenton, N. J., weighs only about one-tenth as much as a duplex reciprocating pump having the same rating, and occupies



COMBINED TURBINE-DRIVEN CENTRIFUGAL BOILER FEEDER WITH CASING REMOVED.

only about one-eighth of the floor space and one-fifteenth of the cubical space. The pump is hydraulically balanced, and only one pair of labyrinth rings, surrounding the suction opening, is required for each impeller except the last, which has two sets of rings. The last impeller, that is, the one from which the water is finally discharged, is equipped with two sets of wearing rings, one on the suction side and one on the reverse side of the web. As some water from the discharge of this impeller will leak between the wearing rings into the space back of the web, this impeller would be as unbalanced as the other impellers in the pump if there were no escape for the leakage water. Consequently a leakage outlet is provided, from which water can be conducted back to the suction of the first impeller.

The outlet leakage takes place between two collars, one attached to the casing and the other carried on the shaft. When the shaft moves toward the discharge end of the pump, this escape is closed off and the pressure builds up in the balancing chamber. If the shaft, on the other hand, moves toward the suction, the escape passage is opened wider, allowing the pressure in the balancing chamber to fall. At the same time the inleakage between the labyrinth wearing rings is decreased. The labyrinth wearing rings are readily renewable, the stationary ring of each pair being held in a seat in the casing, and the rotating ring being screwed upon the impeller. The suction end of the pump is adjacent to the turbine, and the shaft packing between the turbine and pump chambers is hence subjected to turbine-exhaust pressure on one side and the suction pressure on the other. A simple packing is therefore sufficient.

The steam end of the unit consists of a velocity-staged turbine with either two or three rows of moving buckets, according to the steam economy desired. The nozzles can be proportioned for either high-pressure steam exhausting to feed heater or to condenser or for low-pressure steam exhausting to condenser, or the unit can be made interchangeable, thus permitting of a great degree of flexibility in plant design. Where the exhaust steam from the boiler feeder is consumed in heating feed water, the thermal efficiency of the turbine-driven boiler feeder is much greater than that of a boiler feeder driven by electric motor, or even than that of the main unit itself. Ordinarily, a pump governor controlled by the pressure at some point in the feed line near the boilers is employed to control the speed, giving a practically uniform pressure at all deliveries. To guard against any possibility of racing, an emergency governor is also provided. The bearings are of the straight, ring-oiled type, and all of them are made interchangeable.

100-Watt Reading Lamp

A reading lamp is being offered to the trade by the Uno-lite Company of America, Indianapolis, Ind. The specifications for the lamp are: Length of the base, 7.5 in. (19.05 cm.); width of the base, 5 in. (12.7 cm.); extreme height, 19.5 in. (49.53 cm.); diameter of white-lined, green dome, 10 in. (25.4 cm.); diameter of the milk-white semi-inclosing under globe, 6 in. (15.24 cm.); standard finish, Japan bronze; recommended lamp equipment. 100-watt nitrogen-filled, blue-glass daylight lamp.

The field for this type of reading lamp as its manufacturer sees it is in homes and in offices equipped with flat-topped desks. The fact that it is inexpensive and that it is designed to be equipped with a 100-watt lamp is said to make the lamp a device that can be "campaigned" with methods similar to those used in selling electric irons. It is esti-

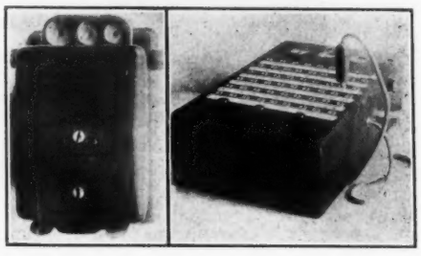
100-WATT READING LAMP FOR FLAT-TOPPED DESK

mated that the central-station revenue which will result per lamp per year from this device will be $6.

From the standpoint of the user the lamp is also utilitarian, being designed to harmonize with any period or design of furnishings. The filament of the lamp is entirely hidden from the eye. The white-lined green porcelain shade, which has become so closely associated with gas and oil portable lamps, provides an inexpensive means of securing the localized light of high intensity which illuminating engineers are generally favoring.

Machine for Collecting Telephone Tolls

A device used as an accessory to telephone systems and which, it is claimed, simplifies the collection of telephone tolls among tenants in apartment



COIN COLLECTOR AND CONTROL DEVICE FOR COLLECTING TOLLS

houses, hotels or other buildings has been developed by the Coin Device & Signal Company, 1269 Broadway, New York City. The device may be placed on the switchboard ledge and connected with a coin collector in every apartment. The machine enables the operator to determine whether a coin is deposited in any particular machine. Such notification will correspond with the different denominations of the coins used. The operator can also cause any number of deposited coins to be delivered to a customer, either for the purpose of making change or for returning the equivalent of any deposited coin or coins. If a tenant does not have the necessary money with which to pay for a call, the operator can cause a check or checks to be issued to the tenant, who in turn deposits them in the machine. The value indicated on these checks is redeemed by the customer when the regular monthly or weekly collections are made.

Resistance Materials

The Independent Lamp & Wire Company, 1737 Broadway, New York City, is now marketing tungsten and molybdenum in sheet, ribbon and plate form. This development makes these metals suitable for new uses and opens to them a much wider field of usefulness than has heretofore existed. The tungsten and molybdenum ribbon is being made in widths of about ¼ in. (6.35 mm.) and in lengths of several yards. In this shape the ribbons ought to be ideal material for the manufacture of heaters of various descriptions and suitable for high temperatures, the manufacturer points out. The United States government has placed an order with this company for plates of these metals for spark gaps on wireless outfits to be used on its Mosquito Fleet.

Trade Notes

HARMON CHESTER CHAPPEL, Ohio representative of the Manhattan Electrical Supply Company, Chicago, Ill., died March 12.

LEON O. HART, electrical engineer for the Driver Harris Wire Company, Harrison, N. J., has recently been appointed assistant treasurer of the company.

HENRY R. STEVENS and Robert L. Rockwell have formed the consulting engineering firm of Stevens & Rockwell, 955 Empire Building, Seattle, Wash.

THE TWINVOLUTE PUMP & MANUFACTURING COMPANY has removed its main office to its new factory at 216-228 High Street, Newark, N. J. The New York sales office will be at 55 William Street.

THE CROCKER-WHEELER COMPANY has declared an extra dividend of 1 per cent in addition to the regular 2 per cent quarterly dividend on the common stock for the quarter ended March 31. The regular quarterly dividend of 1¾ per cent was declared on the preferred stock.

THE INDEPENDENT LAMP & WIRE COMPANY, Inc., 1737 Broadway, New York City, has recently considerably enlarged its facilities to turn out tungsten and molybdenum in sheet form. The tungsten and molybdenum ribbon is being manufactured in a width of about ¼ in. and a length of several yards.

EDGAR M. MOORE & COMPANY, dealers in new and second-hand electrical and steam machinery, Pitsburgh, Pa., are, following recent organization changes, continuing in business at 709-710 Farmers' Bank Building, Pittsburgh, Pa., with warehouse and yard at 916-922 Behan Street, North Side, Pittsburgh.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY has adopted a plan of employee insurance whereby the insurance increases with the length of service until a maximum of $1,000 has been reached. The insurance policy contains a disability clause. It is the intention of the company in taking this step to protect those dependent upon its employees.

THE STANDARD ELECTRIC COMpany, 239 Plymouth Building, Minneapolis, Minn., which for the last two years has been operating as a partnership between Fred G. Dustin and Charles W. Arrick, has been incorporated under the name Standard Electric Service Company, with Messrs. Dustin and Arrick, together with Emil Anderson, as incorporators. Mr. Dustin is president, Mr. Arrick vice-president and treasurer, and Mr. Anderson secretary.

THE NORTHERN CEDAR COMPANY announces this change in its corporate name from Northern Mercantile Company, Ltd., and says: "Spokane is now the real center of the cedar industry, and that we may keep in closer touch with the trade and with our stocks we are changing the location of our general offices from Sandpoint, Idaho, to Spokane, Wash." These changes do not, in any, way, affect the personnel of the organization. The company states that this year its stocks will be the largest and most complete that it has ever carried.

THE ELECTRICAL SUPPLY COMPANY, New Orleans, La., announces that L. L. Hirsch, who has served for the last four years as vice-president, has recently been appointed by the board of directors as general manager of the company and has assumed active charge of the management. Mr. Jumonville, who was formerly active head, has disposed of his interests in the company and has retired. M. J. Elgutter, formerly city sales manager for the Interstate Electric Company, has acquired an interest in the Electrical Supply Company and will immediately assume active charge of the selling organization.

FOOTE, PIERSON & COMPANY, 160 Duane Street, New York City, which has done business under that name for twenty years past, has been dissolved by the retirement of George L. Foote. The business has been taken over and indebtedness assumed by a corporation formed for that purpose under the laws of the State of New York, entitled Foote, Pierson & Company, Inc., under which name the business will be carried on, with offices and works as heretofore at the above address. H. G. Pierson has accepted the presidency and Morris N. Liebmann, who has been with this firm for sixteen years, has been made vice-president and will be in immediate charge of the company's works.

ORANIZATION OF GEAR MANUFACTURERS.—An organization known as the American Gear Manufacturers' Association was formed at Lakewood, N. J., at a meeting held there March 25 and 27. The purposes of the organization are to advance and improve the gear industry in a general way by standardization of gear design, manufacture and application. This association includes in its membership the foremost and better known manufacturers of gears. The executive committee is composed of the following: F. W. Sinram, Van Dorn & Dutton Company, Cleveland, Ohio; H. E. Eberhardt, Newark Gear Cutting Machine Company, Newark, N. J.; F. D. Hamlin, Earle Gear & Machine Company, Philadelphia, Pa.; Frank Horsburgh, Horsburgh & Scott, Cleveland, Ohio; Biddle Arthur, Simonds Manufacturing Company, Pittsburgh, Pa.; George L. Markland, Philadelphia Gear Works, Philadelphia, Pa., and Milton Rupert, R. D. Nuttall Company, Pittsburgh, Pa. The officers elected at the Lakewood meeting are the following: President, F. W. Sinram; vice-president, H. E. Eberhardt; secretary, F. D. Hamlin; treasurer, Frank Horsburgh. The next meeting of the association will be held at Pittsburgh, May 14 and 15.

New Incorporations

THE FAIRMONT (W. VA.) ELECTRIC COMPANY has been incorporated with a capital stock of $10,000 by James A. Knight, D. E. Van Fleet, R. Earl Knight and others.

THE AUTOMATIC CONTROLLER CORPORATION of New York, N. Y., has been incorporated, with a capital stock of $10,000, by F. L. Harris, T. Foster and F. G. Tusa, 76 Central Avenue, New York, N. Y.

THE CAMPBELLSVILLE (KY.) ELECTRIC LIGHT & POWER COMPANY has been chartered with a capital stock of $40,000 by Charles Walls, W. G. Hesser, C. L. Hesser, C. L. Hesser and Bertha Walls.

THE UNITED STATES ELECTRIC COMPANY of Trenton, N. J., has been incorporated by N. W. Nutt, T. and A. Salamandra to manufacture electric appliances. H. M. Hartmann, 228 Tyler Street, Trenton, N. J., is agent for the company.

THE VERMONT & QUEBEC POWER CORPORATION of Richford, Vt., has been incorporated with a capital stock of $500,000 by Charles H. Thompson of Montpelier; Sheldon R. Boright and E. A. Boright of Richford, Vt., and Robert L. Ryder of Boston, Mass.

THE ROWAN CONTROLLER COMPANY, 308 Holliday Street, Baltimore, Md., has been chartered by Wilbur C. Jackson, John S. Rowan and Henry Vogt. The company is capitalized at $100,000 and proposes to deal in electrical machinery, devices and equipment.

THE ELECTRICAL EQUIPMENT COMPANY of Butte, Mont., has been incorporated with a capital stock of $100,000 to do a general electrical business in Butte. A von Dachenhausen is president and general manager. Michael Sullivan will have charge of the structural department.

THE PROGRESSIVE EQUIPMENT COMPANY of New York, N. Y. has been chartered by L. A. Anderson, Courtlandt Nicoll and D. A. Frasey, 61 Broadway, New York City. The company is capitalized at $275,000 and proposes to do a general manufacturing, contracting and electrical engineering business.

THE OVERSTATES MACHINE COMPANY of New York, N. Y., has been incorporated with a capital stock of $25,000 by A. J. McKenzie, Jr., A. Sundh and D. M. Baldwin, Short Terrace, Short Hills, N. J. The company proposes to deal in machinery, mechanical apparatus, pumps, mill, electrical and hydraulic machinery.

THE MITCHELL VANCE COMPANY of Millbrook, N. Y., has been chartered by W. A. Stevens, A. W. Knauth and E. L. Steckler of 61 West Eighty-eighth Street, New York City. The company is capitalized at $105,000 and proposes to manufacture and deal in gas, electric fixtures, supplies, appurtenances, metallic figures, clocks, etc.

THE VICTORIA ELECTRICAL APPLIANCE MANUFACTURING COMPANY of New York, N. Y., has been incorporated with a capital stock of $100,000 by N. Messenger, L. E. Shickerling and A. Schaab, 333 East Eighty-eighth Street, New York City. The company proposes to do a general electrical contracting business, deal in supplies and accessories.

THE PFANSTIEHL COMPANY of Millbrook, N. Y., has been incorporated with a capital stock of $405,000 to manufacture metals of all kinds, electrical and mechanical devices, machinery, etc. The incorporators are: A. E. Moore, 20 Arden Street; G. F. Gebbett, 120 Sherman Avenue, New York City, and F. H. Butehorn, 764 St. Johns Place, Brooklyn, N. Y.

THE LALLEY ELECTRO LIGHTING CORPORATION of New York, N. Y., has been chartered with a capital stock of $115,000 for the purpose of constructing electric-lighting plants, machinery, dynamos, etc. The incorporators are: W. H. Lalley of Detroit, Mich.; T. J. Whalen, 57 West Ninety-second Street, and W. F. Gordon, 61 Broadway, New York, N. Y.

THE WISE-McCLUNG MANUFACTURING COMPANY of Canton, Ohio, has been incorporated, with a capital stock of $200,000, for the purpose of manufacturing electric vacuum sweepers and electrical household appliances. W. J. Wise, formerly connected with the Wise-Harold Company of New Philadelphia, and William McClung are interested in the company.

THE AMERICAN GENERAL ELECTRIC CORPORATION OF CHINA has been incorporated, with a capital stock of $250,000, to manufacture incandescent electric lamps and electrical apparatus. The directors are: Darius E. Peck of Schenectady, A. W. Burchard and E. A. Carlton of New York, N. Y. The principal office of the company is in Rotterdam, N. Y.

THE BURGESS BATTERY COMPANY of Madison, Wis., has been incorporated, with a capital stock of $200,000, to take over the electric battery, flashlight and electrochemical business of the C. F. Burgess Laboratories of Madison. The officers are: C. F. Burgess, president; Duncan Keith, vice-president and sales manager; W. B. Schultze, treasurer, and Benjamin S. Reynolds, secretary and manager.

Trade Publications

LINE APPARATUS.—W. N. Matthews & Brother of St. Louis, Mo., have issued a descriptive leaflet of their pole erector.

FLOOR BOX.—W. R. Ostrander & Company, 371 Broadway, New York City, have issued a leaflet descriptive of their enameled iron floor boxes.

LAMPS.—The Franklin Electric Manufacturing Company of Hartford, Conn., has distributed a leaflet descriptive of its lamps, entitled "A Look Ahead."

CORD CONNECTORS.—Harvey Hubbell, Inc., of Bridgeport, Conn., is distributing bulletin No. 15-23, descriptive of the firm's composition cord connector and small polarized cord connector.

LIGHTNING ARRESTER.—Burke Series horn-gap lightning arresters are illustrated and described in a leaflet prepared by the Railway & Industrial Engineering Company of Pittsburgh, Pa.

CORK.—The Armstrong Cork & Insulation Company of Pittsburgh, Pa., is distributing an illustrated bulletin entitled "Reducing Vibration and Noise." This bulletin describes "Nonpareil" cork machinery isolation for reducing the noise and vibration of fans, motors, printing presses and machinery generally.

REFLECTORS.—The National X-Ray Reflector Company of Chicago, Ill., is distributing a colored folder announcing its nation-wide campaign for X-ray lighting. The purpose of this campaign is to educate the public to demand good light and to bring about wherever possible the establishment of a lighting specialist in each community.

SPRAY EQUIPMENT. — A condensed summarization of the principal Spraco developments is given in bulletin No. 501, recently prepared by the Spray Engineering Company of Boston, Mass. This bulletin includes spray cooling equipment, air washing and cooling equipment, paint-spraying equipment, park sprinklers, flow meters and nozzles for all purposes.

SEW-MOTOR.—An attractive eight-page folder (4152-B), printed in two colors, is supplied to lighting companies and dealers for distribution to prospective customers by the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa. This folder illustrates the little sew-motor, emphasizing its compactness, utter simplicity, pleasing appearance and the ease with which it can be installed.

BUCKETS.—Catalog No. 43, descriptive of Hayward buckets and digging machinery, is being distributed by the Hayward Company, 40 Church Street, New York City. This catalog contains descriptions of orange-peel buckets, clamshell buckets, electric motor buckets, drag scraper buckets, scraper clamshell buckets, excavators, counterweight drums, derrick fixtures, traveling derricks, coal-handling machinery, dredges, etc.

New England States

AUGUSTA, ME.—The Public Utilities Commission has granted the Vassalboro China & Windsor Light Company permission to issue $30,000 in capital stock. Water rights on Seward's mill stream have been secured by the company, which, it is estimated, will develop about 110 hp. The cost of the proposed plant and distribution system is estimated at about $60,000.

LEWISTON, ME.—The Lewiston, Augusta & Waterville Street Railway Company contemplates extensions to its power facilities this year, involving an expenditure of about $200,000.

NEW BEDFORD, MASS.—The directors of the New Bedford Gas & Electric Company have voted to authorize the purchase of an additional generator of 15,000 kw. capacity and an addition to its new power house, now under construction. This means an addition of about 60 ft. to the building and an expenditure of about $500,000.

NEW BEDFORD, MASS.—Mayor Ashley has authorized electric lamps to be placed all along the line of the pipe line between High Hill Reservoir and the pumping station near Lakeside. Electric wires will be strung on the telephone poles along the pipe line. It is also proposed to erect signal stations at certain points and to mount powerful searchlights. The New Bedford Gas & Electric Company furnishes electrical service here.

PROVIDENCE, R. I.—The erection of an electric transmission line along the New London Turnpike is contemplated by the Narragansett Electric Lighting Company.

BRIDGEPORT, CONN.—The United Illuminating Company contemplates extending its transmission lines to Trumbull.

SEYMOUR, CONN.—The Seymour Electric Light Company has petitioned the State Legislature for permission to increase its capital stock to $250,000.

WATERBURY, CONN. — The United Electric Light & Water Company has applied to the State Legislature for permission to increase its capitalization to $3,000,000. The company contemplates extending its high-tension transmission lines to New Britain and Berlin.

Middle Atlantic States

BUFFALO, N. Y.—A permit has been granted to the Buffalo Union Furnace Company for the erection of addition to furnace "A" and generator for power house, to cost about $8,000.

NEW YORK, N. Y.—Plans have been filed by the Interborough Rapid Transit Company for the erection of a boiler plant at its 239th Street yards, to cost about $70,000. The plans also provide for the erection of a signal tower and storage house.

NEW YORK, N. Y.—Part of the plans of the Long Island Lighting Company for consolidating small independent lighting plants on Long Island have been approved by the Public Service Commission. The company will now take over the Suffolk Gas & Electric Company, the South Shore Gas Company and the Huntington Gas Company. Improvements and extensions will be made in the territory now served.

NEW YORK, N. Y.—Bids will be received by the Board of Water Supply, twenty-second floor, Municipal Building, New York City, until April 24, for furnishing and installing and testing complete electric-lighting apparatus at various structures at reservoirs and along the Catskill Aqueduct; also for furnishing and installing a motor and gearing and an electrically driven pump. Contract, drawings, etc., may be obtained at the office of the secretary upon deposit of $10.

NIAGARA FALLS, N. Y.—A bill has been introduced in the Senate by Senator Ross Graves of Buffalo creating the Niagara Hydro-Electric Power Commission. The proposed commission is to construct, maintain and operate a state power plant on the State Reservation at Niagara Falls and to generate and distribute electricity to the communities of western New York. The commission may take from the Niagara River 4400 cu. ft. per second of water, the same to be returned to the river at some convenient place. An appropriation of $850,000 is provided, of which not more than $275,000 is made available during 1917.

PATCHOGUE, N. Y.—The Public Service Commission has authorized the Patchogue Electric Light Company to issue $60 000 in capital stock, the proceeds to be used for new equipment and to reimburse the treasury for expenditures made.

UNION SPRINGS, N. Y.—At an election held March 2 the proposal to purchase the electric plant of the Union Springs Light & Power Company, to be owned and operated by the municipality, was carried.

CLOSTER, N. J.—The Board of Public Utility Commissioners has granted the Rockland Electric Company permission to extend its transmission lines in East Crescent Avenue, Allendale.

DOVER, N. J.—The New Jersey Power & Light Company is planning to install a 3500-kw. steam turbine and two 500-hp. high-pressure boilers in its local plant. The company has discontinued its Boonton plant.

HOPEWELL, N. J.—The Board of Freeholders has granted the Eureka Power Company of Hopewell permission to erect a new transmission line to Washington's Crossing and Titusville in Hopewell Township to furnish electrical service.

SALEM, N. J.—The City Council is considering the installation of electrically operated pumping equipment at the water works station at Quinton.

TRENTON, N. J.—Bids will be received by the City Commission until April 11 for one 8-in. horizonal double-suction centrifugal type pump, with one 35-hp. motor, two phase, 60 cycles, 220 volts, constant speed, squirrel cage type. Leon D. Hirsch is city clerk.

ALTOONA, PA.—The Penn Central Light & Power Company has applied to the Public Service Commission for permission to issue $120,000 in bonds for extensions and improvements to its plant.

CLEARFIELD, PA.—The Penn Public Service Company has applied to the Public Service Commission for permission to issue $338,000 in bonds for extensions and improvements to its plant and system.

ELLWOOD CITY, PA.—Application has been made to the Public Service Commission by the Pennsylvania Power Company for authority to issue $10,000 in bonds for extensions and improvements to its plant.

HARRISBURG, PA.—The City Council has authorized the installation of new single and five-lamp cluster standards in the business section in connection with the new underground conduit system. Clark E. Diehl is city electrician.

LANCASTER, PA.—The Penn Steel & Iron Works is contemplating the installation of new boilers and equipment at its local plant.

LANSFORD, PA.—The Panther Valley Electric Company is contemplating the erection of a new transmission line to connect with its local substation.

NEW BRIGHTON, PA.—The Town Council is reported to have authorized plans prepared for the installation of an electrical distribution system, to cost about $40,000.

READING, PA.—The Reading Transit & Light Company contemplates improvements and extensions this year, involving an expenditure of about $30,000.

NEWARK, DEL.—Two proposals are being considered by the Town Council for increasing the electrical service, one submitted by the Wilmington & Philadelphia Traction Company and one by the Continental Fibre Company.

BALTIMORE, MD.—The Baltimore Car & Foundry Company is planning to install a power plant at its new car and structural steel works now under construction at Curtis Bay.

BALTIMORE, MD.—The Carnegie Steel Company, Bush and Wicomico Streets, contemplates the erection of a power house, 42 ft. by 62 ft., at Gunpowder and Severn Streets, to cost about $5,000.

BALTIMORE, MD.—The property of the Mineral Products Company of Wilmington, Del., has been acquired by the Taber-Davidson Company, manufacturer of fiber, which will establish a plant, to be equipped with motor-driven machinery. Harry B. Taber is president.

GRANTSVILLE, MD.—The town of Grantsville has entered into a contract with the Boynton (Pa.) Electric Company for lighting the streets of the town.

HAVRE DE GRACE, MD.—Plans have been prepared for the construction of a metal tie plant for the Maryland Metal Cross Tie Company. Two buildings will be erected, one 600 ft. by 70 ft., the other 350 ft. by 60 ft., equipped with open-hearth furnaces, molding machines, conveyors, electric cranes, etc. Thornton W. Price, Woolworth Building, New York, N. Y., is architect and engineer.

HARRISONBURG, VA.—The City Council has decided to install an additional generating unit at the municipal hydroelectric plant, at a cost of about $18,000. The plant is located on the Shenandoah River about 14 miles from the city.

NEWPORT NEWS, VA.—Preparations are being made for extensions to the water and light plant of the Newport News Light & Water Company, involving an expenditure of about $300,000. Contracts have been placed for material, etc.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Charleston, S. C., Schedule 879—two sets of storage batteries. Brooklyn, N. Y., and Mare Island, Cal., Schedule 888—three exhausting blowers; Schedule 889—eight oil coolers. Philadelphia, Pa., Schedule 878—100,000 duct ft. vitrified clay conduits; Schedule 886—two generating sets. Portsmouth, N. H., Schedule 862—9600 steel boiler tubes. Puget Sound, Wash., Schedule 868—328 oil and grease cups; Schedule 867—410 lb. soft copper wire, 5900 lb. black galvanized iron or steel wire, 195 lb. crucible spring steel wire. Application for proposal blanks should designate the schedule desired by number.

North Central States

DETROIT, MICH.—The Ireland & Matthews Manufacturing Company of Detroit, manufacturer of stove trimmings, automobile supplies, etc., is building a plant on a site bounded by Beard, Chatfield and Green Avenues and the Michigan Central Railroad, at a cost of about $500,000. A power plant, 51 ft. by 178 ft., is included among the buildings.

DETROIT, MICH.—The Council committee has recommended for approval the following items submitted by the Public Lighting Commission: A new lighting system on West Fort Street, to cost $45,304; Mack Avenue, $10,620; John Street, $88,044; Kercheval Avenue, $86,000; Junction Avenue, $54,000; Hamilton Boulevard, $45,000; Lodge Avenue, $6,800; a new substation near Woodmere, with equipment and conduits, $48,354, and new alley lamps, $15,000.

DETROIT, MICH.—Franchises have been granted to the Detroit Edison Company in most of the townships in St. Clair County, among them Port Huron, Kimball, St. Clair, Casco and Columbus. Similar franchises will probably be voted this spring by Riley, Wales and Berlin Townships. The company contemplates the construction of a power plant on Bunce Creek, near Marysville, St. Clair County, and the erection of a substation at South Park, Port Huron, this year.

LAPEER, MICH.—The Lapeer Gas-Electric Company contemplates the construction of a coal-conveying and storage system. C. D. Hulbert is general superintendent.

MONROE, MICH.—The city of Monroe has decided to accept the proposal of the Detroit Edison Company to supply energy here.

ASHLEY, OHIO.—The Ashley Electric Light & Power Company, recently organized with a capital stock of $10,000, proposes to construct and operate an electric-light plant in Ashley. C. F. Sperry, J. B. Johnston and others are interested.

CANTON, OHIO.—The Sunnyside Electric Company has completed the erection of a 55-mile transmission line from Wheeling, W. Va., to Canton, Ohio, and is now building a 60,000-kw. substation in Canton. F. A. Pearson is superintendent of construction.

CINCINNATI, OHIO.—A committee, consisting of I. I. Stein, John Steinmueller and J. B. Scheve, has been appointed by the Findlay Market Association to secure a complete lighting system for the new Findlay Market and surroundings.

CINCINNATI, OHIO.—Plans have been completed by the city electrician for the proposed ornamental lighting system for the central part of the city. The proposed system will be installed with the co-operation of the Retail Stores Association of the Chamber of Commerce and the United Boulevard Lighting Committee.

CLEVELAND, OHIO. — The Supreme Court at Columbus has handed down a decision upholding the validity of four bond issues, amounting to $2,300,000, of which $700,000 is for the addition to the municipal electric-light plant.

CUYAHOGA FALLS, OHIO.—Plans are being prepared by the Marathon Tire & Rubber Company for a power house to be erected in the rear of its factory this summer. The proposed plant will have an out-

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

put of 5000 kw. The company is also planning to build a dam and install a 100-hp. hydraulic plant.

DAYTON, OHIO.—The Dayton Power & Light Company has been granted a franchise to erect electric transmission lines off the Troy Pike to supply electricity for lighting purposes.

DAYTON, OHIO.—The Lindner Brothers Sanitary Milk Company has decided to purchase a site adjoining its property on 723 East May Street, on which it proposes to erect a power house. The total cost of power plant is estimated at $15,000.

LORAIN, OHIO.—The Lorain County Electric Company, it is reported, will soon begin work on the reconstruction of the local distribution system. Plans have been prepared for erecting iron posts in the business district and removing all service lines from Broadway.

MARIETTA, OHIO.—Bids, it is reported, will soon be asked for a new boiler and other equipment for the municipal electric-light plant.

MOUNT GILEAD, OHIO.—Preliminary work has commenced on the reconstruction of the plant of the Hydraulic Press Manufacturing Company, which was destroyed by fire. The plans provide for the erection of a new machine shop, 100 ft. by 200 ft., equipped with large traveling cranes, a power plant, 42 ft. by 60 ft., stock room, 50 ft. by 60 ft., and a large forge shop. E. B. McMillan is general manager.

TROY, OHIO.—The City Council has voted to authorize $30,000 in bonds for the purchase of an additional engine, boilers and other equipment for the municipal electric-light plant.

AUBURN, KY.—The local ice manufacturing plant, owned by R. W. Wilson, was recently destroyed by fire, causing a loss of about $10,000.

HOPKINSVILLE, KY.—The city of Hopkinsville contemplates the installation of an ornamental street-lighting system, consisting of 80 single lamp standards. Plans and specifications may be secured upon application to Frank H. Bassett, commissioner of public lighting.

ALLENDALE, ILL.—A company has been organized to construct and operate an electric-light plant in Allendale. The company is capitalized at $8,000. Elijah Greathouse and Ethel Campbell are among the incorporators.

GIBSON CITY, ILL.—The City Council has decided to compromise with the Central Illinois Utilities Company and the project of installing a municipal electric plant will be abandoned. The company agrees to a general reduction of rates and will also erect a steam plant in Gibson City to provide for local needs.

TOULON, ILL.—The property of the Toulon Light & Power Company has been purchased by the Stark County Power Company of Wyoming. A transmission line to connect the two plants will be erected by the Stark County Power Company.

MILWAUKEE, WIS.—Work will begin during the coming summer on the construction of the new steam electric generating plant of the Milwaukee Electric Railway & Light Company, to be located on the shore of Lake Michigan, just south of St. Francis, a suburb of Milwaukee. The initial installation will provide for a generating capacity of 65,000 hp. The plans provide for an ultimate output of 200,000 kw.

NEENAH, WIS.—The Wisconsin Traction, Light, Heat & Traction Company has awarded a contract to the Blake Construction Company of Appleton for the construction of a substation at Neenah.

ROTHSCHILD, WIS.—Bids are being asked by Vaughn & Meyer, Majestic Building, Milwaukee, consulting engineers, for a turbine-driven centrifugal feed pump, one 3000-hp. feed-water heater and water-meter unit, for the new power plant of the Marathon Paper Mills Company to be erected at Rothschild.

SHEBOYGAN, WIS.—Bonds to the amount of $998,000 have been authorized by the Eastern Wisconsin Electric Company of Sheboygan, of which a large portion of the proceeds will be used for the construction of a steam power plant at Sheboygan, to develop from 5000 to 6000 hp., and the erection of an electric transmission line from Oshkosh to Fond du Lac. The company recently took over the Wisconsin Traction Company of Oshkosh, the Eastern Wisconsin Railway & Light Company of Fond du Lac and the Sheboygan Electric Company.

STEVENS POINT, WIS.—Plans have been submitted by the Jackson Milling Company for the erection of a new hydroelectric plant. The company, it is reported, proposes to transmit electricity to its paper mill in Biron, Wis.

ANOKA, MINN.—Plans are being prepared by the Federal Cartridge Company for the erection of a machine shop and a power house, to cost about $60,000. P. R. Seidell, 1913 Dupont Street, Minneapolis, is president.

CANBY, MINN.—The Citizens' Light, Heat & Power Company has been granted a franchise to erect a transmission line to Hendricks.

FARIBAULT, MINN.—The City Council has instructed the city engineer to prepare estimates of the cost of the installation of a municipal electric-light plant.

LAKE PARK, MINN.—The municipal electric-light plant is being remodeled, the motive power being changed from oil to steam and the system from direct to alternating current. Improvements will be completed about Aug. 1, 1917. James Thompson is manager.

VIRGINIA, MINN.—The Great Northern Power Company has been awarded a contract to supply energy to the Dunwoody Mine, near Chisholm. Work will soon start on the erection of an electric transmission line from Thomson to Hibbing. The local plant of the company is being enlarged.

WATERTOWN, MINN.—**The Crescent Electric Company has recently completed a transmission line from Watertown to Mayer, a distance of 7 miles, and from Mayer to New Germany, 3¾ miles, and a distribution system in New Germany. In the latter place the company purchased the** old direct current plant and remodeled it for alternating current. Guy E. Halgren is president.

MOUNT AYR, IOWA.—The Mount Ayr Light & Power Company is contemplating extending its electric transmission lines to the towns of Maloy and Benton.

PISGAH, IOWA.—Bonds to the amount of $14,000 have been voted for improvements to the electric-light plant and water-works system.

KANSAS CITY, MO.—Extensions and improvements are contemplated by the Kansas City Home Telephone Company, including the installation of additional switchboard equipment at the main telephone exchange and cable and equipment for extensions.

BRADLEY, S. D.—The Dakota Northern Power Company, with headquarters in Bradley, has recently turned current on a 24-mile transmission line, which supplies electricity in the towns of Lily, Butler and Bristol. The company has also purchased the plants in the towns of Henry and Raymond and will erect a transmission line to supply energy in those towns. E. H. Lewis is manager.

GETTYSBURG, S. D.—A proposal to establish an electric-light and power plant in Gettysburg is reported to have been submitted to the Council by Hugh Triplett, consulting engineer, of Aberdeen.

WATERTOWN, S. D.—**Contracts have been placed by the Watertown Light & Power Company for a 600-kw. General Electric steam turbine with Wheeler Condenser & Engineering Company surface condenser, to be delivered July 1, 1917. C. H. Bell is superintendent.**

COLUMBUS, NEB.—At an election held recently the proposal to grant the Columbus Light, Heat & Power Company a new franchise for lighting the city was carried.

NORFOLK, NEB.—The Nebraska Gas & Electric Company contemplates the erection of an electric transmission line from Norfolk to Hadar, a distance of 5½ miles. The installation of a 75-kw. and a 100-hp. steam turbine in the near future is also under consideration. R. L. Ponsler is local manager.

RANDOLPH, NEB.—Plans are being considered by the City Council for the installation of a new 120-hp. oil engine and an 85-kw. generator in the municipal electric-light plant.

STANTON, NEB.—Plans are being considered to extend the service of the municipal electric plant into the farming district, which will require the erection of about 13 miles of transmission lines. Under the present arrangement the farmers will build the line to the city limits.

ABILENE, KAN.—The installation of an ornamental lighting system in the Matteson addition is under consideration.

ARMSTRONG, KANSAS CITY, KAN.—The Union Pacific Railway Company has awarded the George A. Fuller Construction Company, Dwight Building, Kansas City, the general contract for construction of roundhouse, power house, coaling station and turntable pit. The total cost of the work is estimated at $200,000.

CAWKER CITY, KAN.—The installation of an ornamental lighting system in Cawker City is under consideration.

CLAY CENTER, KAN.—Work has begun on the construction of a cold storage and poultry establishment for the Clay County Produce Company on Sixth Street. The main building will be 75 ft. by 200 ft.; the power house, 60 ft. by 35 ft., will be connected with the main building by an overhead steel track.

LAWRENCE, KAN.—Preparations are being made by the Coal District Power Company of Lawrence to enlarge the plants, which it has acquired at Greenwood, Mansfield, Huntington and Hartford, Ark. The company is reported to be in the market for electric generating machinery and water-works equipment, to cost $75,000.

PALCO, KAN.—The installation of a municipal electric-light plant in Palco is reported to be under consideration.

VALLEY FALLS, KAN.—The local electric-light plant is reported to have been purchased by Mexley & Company.

WELLSVILLE, KAN.—The Wellsville Electric Light & Power Company is installing a Snow crude oil engine of about 120 hp. and a 100-kva. Westinghouse three-phase, 60-cycle generator as a second unit for its power house. C. A. Smith is owner.

WICHITA, KAN.—**Contracts have been placed by the Kansas Gas & Electric Company for material for the erection of about 50 miles of 66,000-volt transmission line and 50 miles of 22,000-volt transmission line, and also for equipment for increasing the output of its plant by 15,000 kw.**

Southern States

KELFORD, N. C.—The installation of an electric-lighting plant in Kelford is under consideration. J. E. Tyler and associates are interested.

CHARLESTON, S. C.—At an election held March 3 the proposal to purchase the property of the Charleston Light & Water Company, for $1,360,000, was carried. An additional bond issue of $140,000 was also authorized for improvements to the water-works system. The light and water plant will be operated by a board of three commissioners.

ATHENS, GA.—The Athens Railway & Electric Company is installing a 2000-kw. turbine.

CLEVELAND, GA.—The Henderson Mills and a 150-acre site, it is reported, have been purchased by W. E. White of Jefferson. The new owner, it is said, contemplates the construction of a dam and electric plant.

CENTERVILLE, TENN.—The City Council has engaged Frank Wilcox, consulting engineer, St. Louis, Mo., to make surveys and prepare estimates of the cost of installation of an electric-light plant and water-works system.

JACKSON, TENN.—The Jackson Railway & Light Company has awarded the contract for addition to its power house to E. G. Parrish of Jackson.

NEWPORT, TENN.—Improvements are to be made to the power plant of the Newport Mill Company. A new power house will be erected, repairs made to the dam, and new equipment installed. A 24-hour service will also be established.

MARION, ALA.—The electric plant of the Marion Electric Company was recently destroyed by fire, causing a loss of about $10,000. The plant, it is understood, will be rebuilt.

BRADFORD, ARK.—The construction of an electric-light system in the business section is reported to be under consideration by Messrs. Campbell and Prescott.

LITTLE ROCK, ARK.—J. W. Bleidt, superintendent of the municipal electric light plant, has recommended to the City Council the purchase of a 500-hp. boiler for the municipal electric-light plant at once.

OZARK, ARK.—The local electric-light plant, owned by Bill & Dupriest, has been sold to the Citizens' Service Company of Davenport, Iowa, for $20,000.

MONROE, LA.—At an election held recently the proposal to issue $612,000 in bonds for improvements to the water and light plants, construction of a filtration plant, sewer system, etc., was carried.

RAYNE, LA.—Bids will be received by the city of Rayne until April 23 for furnishing and installing machinery at the municipal electric-light and water-works plant. Plans and specifications can be obtained at the office of Harold Raymond, consulting engineer, Interstate Bank Building, New Orleans, La., or from O. P. Bonin, Mayor, Rayne.

CLAREMORE, OKLA.—The Claremore Commercial Club, it is reported, is considering the construction of an electric railway from Skiatook to Pryor, via Collinsville and Claremore, about 40 miles in length.

FREDERICK, OKLA.—Bonds to the amount of $35,000 have been voted for the purchase of the local electric-light plant and improvements to same.

LAHOMA, OKLA.—The Enid (Okla.) Electric & Gas Company is contemplating a number of improvements and extensions to its local system.

OKEMAH, OKLA.—Preliminary plans are being prepared by the Benham Engineering Company, Concord Building, Oklahoma City, for municipal improvements, including improvements to electric-lighting system, to cost $20,000, extensions to waterworks mains, $20,000, and sewer system, $45,000. An election will soon be called to submit the proposal to issue bonds for the above work to the voters.

SKIATOOK, OKLA.—Bonds to the amount of $20,000 have been authorized. Of the proceeds $12,000 will be used for the installation of a municipal electric-light plant, $6,000 for improvements to waterworks system and the remainder for sewers.

STRATFORD, OKLA.—Bonds to the amount of $2000 for the installation of an electric-lighting system have been authorized.

BROWNWOOD, TEX.—The Texas Power & Light Company is planning to install another 500-hp. Diesel engine directly connected to a General Electric alternator in its local plant.

COLLEGE STATION, TEX.—The general contract for the construction of a power plant at the Agricultural and Mechanical College has been awarded to the Gilsonite Construction Company of Dallas, at $57,100. The appropriation for the power plant was $67,000.

KAUFMAN, TEX.—The Texas Power & Light Company of Dallas has purchased the local plant and has been granted a franchise by the city. The present power plant will be dismantled and electrical service supplied from a transmission line from Trinity Heights and Jenkins.

PRAIRIE VIEW, TEX.—The contract for wiring, and lighting, including the auditorium, veterinary science building and household arts building at Prairie View, has been awarded to A. T. Vick of Houston, at $6,904.

SAN BENITO, TEX.—The Santa Helena Improvement Company is contemplating the construction of a system of canals and ditches for irrigating about 16,000 acres of land at San Benito, and the installation of an irrigation pumping plant on the Rio Grande River. The cost of the project is estimated at about $500,000.

SAN DIEGO, TEX.—The Board of Water Engineers has granted the San Angelo Water, Light & Power Company authority to construct a dam across the Concho River to impound the storm and flood waters of that stream in sufficient quantity to supply the city of San Angelo with water for municipal and domestic purposes.

WELLINGTON, TEX.—The plant of the Wellington Power & Light Company was recently destroyed by fire. A new plant, to cost about $15,000, will be built.

WICHITA FALLS, TEX.—The City Council is considering plans for the installation of an ornamental street-lighting system.

Pacific and Mountain States

ARLINGTON, WASH.—The Washington Coast Utilities Company is planning to rebuild the transmission line between the power plant on Jim Creek and Arlington this spring; improvements are also contemplated at the local plant and substation and also the installation of considerable new electrical equipment. The company has closed a contract with the Stone & Webster interests for extra power that it may need. The Stone & Webster system will be tapped at Fir by a transmission line extending east from Stanwood, via Cedarhome.

BELLINGHAM, WASH.—The Board of Education is considering the installation of an electric-light and power plant in the Whatcom High School.

COLVILLE, WASH.—Notice of location of water rights of 20,000 cu. ft. of water for site for a hydroelectric power plant has been filed by the Big Bend Transit Company of Coville.

PALOUSE, WASH.—The City Council has granted the Washington Water Power Company a new 25-year franchise to supply electricity in Palouse, under the terms of which the company is to rebuild the entire system.

SEATTLE, WASH.—Plans have been completed by the Pacific Construction & Engineering Company for construction of a forge shop, power house and office building, to cost about $20,000.

SEATTLE, WASH.—Bids will be received by C. E. Dole, purchasing agent, Alaska Engineering Commission, Bell Street Dock, Seattle, until April 17 for furnishing wire, equipment, etc., for the installation of a telephone system at Anchorage, Alaska, and improvements to the government telegraph system in the north under circular No. 261. Among the material is included: 200,000 lb. copper wire, 61,000 lb. galvanized wire, 2100 ft. copper cable, 4000 cross arms, 7500 brackets, 400 telephones, two switchboards, 34,000 ft. guy wire, 10 barrels of batteries, 15,000 ft. coppered-steel wire, 3000 ft. lamp cord, 50,000 ft. solid wire, 25,000 ft. rubber-covered wire, 18,000 ft. of stranded wire, 10,000 ft. rubber-covered wire, 5000 ft. twisted wire, 130 meters, several hundred conduits, several thousand lamps, reflectors, plugs, etc.

SPOKANE, WASH.—Petitions for a new street-lighting system on Second Avenue, from Division to Cedar, are now being circulated among property owners. The proposed system will cover about fifteen blocks and will cost about $60,000. Another effort is being made to obtain an ornamental lighting system on Howard Street, in the business district.

KLAMATH FALLS, ORE.—The Keno Power Company of Kent has filed a petition asking that an ordinance granting the company a 50-year franchise in Klamath Falls be submitted to the voters.

KLAMATH FALLS, ORE.—The City Council has passed an ordinance authorizing the sale of $300,000 in warrants, to provide funds for the construction of the Klamath Falls Railroad to Dairy, 25 miles distant.

KLAMATH FALLS, ORE.—As soon as weather conditions will permit the California-Oregon Power Company will begin work on the completion of its large dam and power plant across the State line at Copco. The new dam is being erected across Ward's Canyon of the Klamath River; it will be 400 ft. long and 150 ft. wide. Water will be carried from the top of the dam to the power house in four steel pipes, 12 ft. in diameter, and will be capable of developing 50,000 hp. Transmission lines from the power house will be erected toward Klamath Falls, Weed, Yreka and Medford .

PORTLAND, ORE.—The City Council has decided to submit to the voters the proposal to issue $1,777,000 in bonds for the installation of a municipal electric plant at the city election to be held in June.

EXETER, CAL.—Preliminary surveys are being made by the Visalia Railroad Company for further extensions of its railway into the foothills east of Porterville, to connect with the Porterville Northeastern Railroad at Adobe station.

LOS ANGELES, CAL.—Electric-lighting fixtures and a telephone switchboard are provided for in an appropriation of $51,500 made by the Board of Education for improvements and equipment for the Los Angeles High School.

LOS ANGELES, CAL.—The City Council has instructed the city attorney, city engineer and city electrician to prepare an ordinance providing for the installation of a lighting system on Lanewood Avenue, between Orange and La Brea avenues.

OROVILLE, CAL.—The United States Exploration Company contemplates the erection of a large mill and power plant at its mine in Granite Basin in the near future.

SALINAS, CAL.—The cost of a distributing system for lighting the city and the erection of a small substation is estimated at $12,868.

SAN BERNARDINO, CAL.—Application has been filed with the State Railroad Commission by Damon Cooley of San Bernordino and V. K. McMains of Los Angeles for permission to build a power plant and distribution system to supply electricity during the summer season to the hotel at Pine Knot and Knight's Camp and to approximately 200 cabins about the lake. It is proposed to install a 50-kw. generator and a 25-hp. oil engine. The cost of the system is estimated at $8,000.

WASCO, CAL.—At an election held recently the proposal to install an electric-lighting system in Wasco was carried.

WEAVERVILLE, CAL.—The Railroad Commission has authorized the Northern California Power Company of San Francisco to extend its electric transmission lines in Trinity County from the Lappin Mine through Lewiston to Weaverville and to sell electricity in all parts of the county with the exception of certain portions of Weaverville.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company is planning to rebuild its electric transmission line from the substation west of the city to the Jordan Narrows to enable the company to give the cities and towns south of this city better electrical service.

CLARKDALE, ARIZ.—Permission has been granted by the Corporation Commission to the Steam Generating Company to install a steam-driven electric generating plant in Clarkdale and lease same to the Arizona Power Company.

PEACH SPRINGS, ARIZ.—Preliminary surveys are now being made by engineers under the direction of the W. L. Clark Construction Company of New York with a view of constructing four large dams across the Diamond and other lateral canyons of the Grand Canyon of the Colorado River near Peach Springs. Financial interests connected with the Atchison, Topeka & Santa Fe Railroad, it is stated, are connected with the proposed project. The plans provide for the erection of electric transmission lines that will extend to many cities, towns and mining camps in Arizona.

BUTTE, MONT.—The Butte Electric Railway Company is contemplating the construction of two substations, one 500 kw. and the other 1500 kw. capacity.

DENTON, MONT.—Application has been made to the town of Denton by Messrs. O'Neil & Saunders of Great Falls for a franchise to install and operate an electric-light plant here.

CLOVIS, N. M.—Bids will be received at the office of the City Clerk, Clovis, until April 18, for furnishing material and equipment for electric-light plant and waterworks system, separate bids to be submitted as follows: (1) For one 240-kva. generator, three 40-hp. motors, one 20-hp. motor, switchboard and equipment; (2) one uniflow engine for a 240-kva. generator; (3) four centrifugal pumps; (4) one 500-hp. heater; (5) cast-iron pipe and special castings; (6) hydrants and valves. Specifications are on file in the office of the City Clerk, Clovis, and in the office of Burns & McDonnell, Inter-State Building, Kansas City, Mo.

GALLUP, N. M.—The Board of Trustees has granted George A. Keepers a franchise to supply electricity for lamps, heaters and motors in Gallup for a period of 25 years. Mr. Keepers, it is understood, will erect a power plant.

Canada

ENDERBY, B. C.—The construction of an electric-light plant is under consideration by the Town Council.

CARMAN, MAN.—The installation of a 100-hp. boiler in the municipal electric-light plant is under consideration.

AYLMER, ONT.—The Town Council is considering submitting the proposal to install a hydroelectric system in Aylmer to the voters.

ST. CATHARINES, ONT.—The Hydro-Electric Commission of St. Catharines has decided to erect a new electric transmission line from Niagara Falls to this city.

SPRINGBANK, ONT.—Plans are being considered by the Utilities Commission for a power development, to cost about $20,000. It is proposed to rearrange the pumping station and install additional equipment to develop about 1500 hp. E. V. Buchanan, City Hall, London, is manager for the commission.

SUDBURY, ONT.—The development of the water power at the falls on the French River in order to supply power to the British-American Nickel Refinery will probably be undertaken at an early date. The work will probably be done under the direction of the Ontario Hydro-Electric Commission or by private enterprise.

TORONTO, ONT.—Work calling for a total expenditure of $6,928,790 is contemplated by the Hydro-Electric Power Commission of Ontario for the fiscal year ending Oct. 31, 1917, including Niagara power development, $1,000,000; Niagara system steel tower lines, $985,000; Niagara transformer stations, $2,364,791; Niagara distributing stations and low-tension transmission lines, $344,495; Severn system extensions, $121,238; St. Lawrence system extensions, $52,880; Eugenia system extensions, $217,897; Port Arthur systems extensions, $6,185; Muskoka system extensions, $17,298; Central Ontario system extensions, $1,695,000; miscellaneous expenditures, $112,000, and office building, $12,000. F. A. Gaby is chief engineer.

DRUMMONDVILLE, QUE.—The Southern Canada Power Company of Drummondville has acquired the property of the Richmond (Que.) County Electric Company and the Brome Lake Company of Waterloo, which supplies electricity in the towns of Waterloo, Knowlton and Foster, and has a small developed water power with an ultimate capacity of 2000 hp. This water power will eventually be used as an auxiliary to the main system. The town of Richmond will be connected with the main transmission line of the company, which extends from Drummondville to Sherbrooke.

Directory of Electrical Associations

Printed in the First Issue of Each Month

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, Arthur Kneisel, 29 South LaSalle St., Chicago, Ill.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 8 West 40th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. General meeting, Detroit, May 2-5.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, F. A. Molitor, 35 Nassau St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country. Annual convention, Hot Springs, Va., June 26-29.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary-treasurer, Roy B. Fowles, Pine Bluff, Ark. Annual convention Pine Bluff, May 16-18.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General Secretary, C. E. Dustin, 62 Cedar St., New York.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, George C. Holberton, San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, John F. Kelly, McKeesport, Pa.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago.

BRITISH COLUMBIA ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary-treasurer, E. Brettell, Electric Supply Company, Ltd., Vancouver, B. C.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, James Redpath, 505 Rialto Bldg., San Francisco, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, Excelsior Life Building, Toronto, Can.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, J. E. Kearns, General Electric Company, Schenectady, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF CONNECTICUT. Secretary, George M. Chapman, Waterbury, Conn.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE STATE OF PENNSYLVANIA. Secretary, M. G. Sellers, 1518 Sansom St., Philadelphia.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, J. C. Staff, 578 Jackson St., Milwaukee, Wis.

ELECTRICAL DEALERS AND CONTRACTORS' ASSOCIATION OF ONTARIO. Secretary, E. A. Drury, 45 Murray St., Toronto, Can.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General Secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Semi-annual meeting, Hot Springs, Va., May 23-25.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, 34 Ellis St., San Francisco, Cal.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago. Meeting, Hot Springs, Va., June 11-14.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Affiliated with the N. E. L. A. Secretary, A. Jackson Marshall, 29 West 39th St., New York.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

FLORIDA ENGINEERING SOCIETY, Secretary, J. R. Benton, Gainesville, Fla.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

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ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, R. H. Abbott, Petersburg, Ill.

ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. L. Blumenthal, 179 West Washington St., Chicago, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, G. H. Stickney, 4th and Sussex Sts., Harrison, N. J. Sections in New York, Philadelphia, Pittsburgh, Cleveland, Chicago and Boston. Annual convention, Newark, N. J., September.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skillman, Indianapolis, Ind.

INDUSTRIAL ELECTRIC HEATING ASSOCIATION. Secretary, Homer Kunz, Toledo Railways & Light Co., Toledo, Ohio.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, David Sarnoff, 111 Broadway, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre. 28 Victoria St., Westminster, London, S. W., England.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Iowa.

IOWA SECTION, N. E. L. A. Secretary-treasurer, L. E. Caldwell, Iowa City, Iowa. Annual meeting, Des Moines, May 25 and 26.

JOVIAN ORDER. Jupiter (president), Henry L. Doherty, New York City; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Mercer, 108 West Eighth Ave., Topeka, Kan.

KANSAS PUBLIC SERVICE ASSOCIATION. Secretary, E. A. Wright, Manhattan, Kan.

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MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 14 Seventh St., N., Minneapolis, Minn.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary, Fred A. Otto, Albert Lea, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the N. E. L. A. Secretary-treasurer, R. H. Smith, Jackson, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, William L. Smith, Concord, Mass.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 39th St., New York. Annual meeting Atlantic City, N. J., May 29 to June 1.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, H. C. Brown, 41 Martin Building, Utica, N. Y. Next meeting, New Orleans, October, 1917.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Sceretary, Frederic P. Vose, 1343 Marquette Bldg., Chicago, Ill.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee. Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer. B. E. Egan, Room 201, Union Pacific Building, Omaha, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, Franz Neilson, 120 Broadway, New York.

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NORTHWEST SECTION, N. E. L. A. Secretary, J. F. Farquhar, Washington Water Power Company, Spokane, Wash.

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PACIFIC COAST SECTION, N. E. L. A. Secretary, A. H. Halloran, Rialto Bldg., San Francisco, Cal.

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PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, W. J. Kehl, Virginia Railway & Power Co., Richmond, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davisson, West Virginia Water & Electric Co., Charleston, W. Va.

RADIO CLUB OF AMERICA. Secretary, David S. Brown, 206 West 86th St., New York.

ROCKY MOUNTAIN ASSOCIATION OF MUNICIPAL ELECTRICIANS. President, Lawrence Stone, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTH DAKOTA ELECTRIC LIGHT ASSOCIATION. Secretary, A. H. Savage, Dakota Light & Power Co., Flandreau, S. D.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, George H. Wygant, Tampa, Fla.

SOUTHERN CALIFORNIA ELECTRICAL CONTRACTORS & DEALERS' ASSOCIATION. Secretary, H. C. Bower, 602 Metropolitan Bldg., Los Angeles, Cal.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex. Annual convention, Dallas, April 26-28.

SOUTHWESTERN SOCIETY OF ENGINEERS. Secretary, Prof. A. F. Barnes, State College, N. M.

TEXAS STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Eugene Ashe, Dallas, Tex.

TRI-STATE WATER & LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

VIRGINIA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. M. Andrews, Richmond.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Bldg., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

1,220,166. VARIABLE MAGNETIC-OPPOSED REACTION-COIL ELECTRIC CIRCUIT; Irving E. Aske, Duluth, Minn. App. filed June 11, 1915. Means for electrically operating a plurality of mechanisms or translation devices simultaneously or any of them separately.

1,220,168. OUTLET BOX; Arthur W. Baker, Danbury, Conn. App. filed Feb. 19, 1915. For detachably connecting electric conduits of any desired type to the outlet box.

1,220,174. PADLOCK SWITCH; Stephen F. Briggs, Milwaukee, Wis. App. filed Sept. 13, 1915. For controlling an ignition circuit for automobile gas engines.

1,220,220. ELECTRIC SWITCH MECHANISM; David D. Gordon, Chicago, Ill. App. filed Nov. 6, 1915. Quick-make-and-break type.

1,220,228. TELEPHONY; David S. Hulfish, Toronto, Ontario, Canada. App. filed Sept. 30, 1912. Application of methods and apparatus for telephone switching in central offices of telephone exchanges.

1,220,229. RING OR BAND FOR USE IN PILE-DRIVING; Henry Illback, East Orange, N. J. App. filed Aug. 12, 1916. Improvements.

1,220,235. ELECTRIC HEATER; Eliot Keen, Brooklyn, N. Y. App. filed February 28, 1916. Portable.

1,220,238. QUADRUPLEX TELEGRAPHY; Isidor Kitsee, Philadelphia, Pa. App. filed Dec. 30, 1916. Submarine cables.

1,220,255. ELECTRICAL REGULATOR; Frank W. Merrill, Chicago, Ill. App. filed Dec. 6, 1913. For automatically maintaining constant, substantially, the voltage or amperage, or both, of an electric current.

1,220,260. SECTIONAL REINFORCING ELECTROPLATING MACHINE; George O. Morrison and Wilfred Thompson, Toronto, Ontario, Canada. App. filed June 2, 1916. Continuous automatic machine for reinforcing the electroplating or the sections subject to wear on the back pieces of table silver, etc.

1,220,262. WATER-ELECTROLYZING APPARATUS; Rudolph J. J. Mueller and Erroll G. Rowlands, Sheboygan, Wis. App. filed Jan. 17, 1917. Improved construction of the tank and diaphragm frame.

1,220,277. CURRENT GENERATOR AND SPARK DISTRIBUTOR; David E. Ross, Lafayette, Ind. App. filed Jan. 25, 1916. To produce the necessary current for the charge-igniting sparks, at the proper cyclic time, in the operation of internal combustion engines.

1,220,280. AUDIBLE SIGNALING DEVICE; John R. Simpson, Troy, Ohio. App. filed April 8, 1914. Operating means for changing the tone whereby at least two distinct sounds of different intensity are produced by the same apparatus.

1,220,326. CONNECTING DEVICE; Arthur H. Fargo, Wilmington, Del. App. filed April 10, 1914. Improvements.

1,220,333. INSULATOR CLAMP; Edwin G. Hatch, Hoboken, N. J. App. filed May 19, 1916. Applicable to insulators carrying high-tension line wires or heavy wires.

1,220,342. CLOSING DEVICE FOR ELECTRIC CIRCUITS; William A. Kilmer, De Kalb, Ill. App. filed Jan. 2, 1914. Relates to fence-fabric-making machinery.

1,220,370. CONSTANT-VOLTAGE SYSTEM; Thomas Spencer, Philadelphia, Pa. App. filed Dec. 1, 1913. Primarily intended for car lighting.

1,220,371. CONSTANT-VOLTAGE SYSTEM; Thomas Spencer, Philadelphia, Pa. App. filed June 11, 1914. Employing opposing fields.

1,220,384. RENEWABLE FUSE; Edgar H. Wilson, Chartiers Township, Allegheny County, and William F. Clark, Coraopolis, Pa. App. filed Nov. 3, 1914. Improved.

1,220,414. ELECTRIC-SWITCH MECHANISM; David D. Gordon, Chicago, Ill. App. filed May 13, 1916. Quick-make-and-break type.

1,220,433. ELECTROMAGNET; Charles L. Krum and Howard L. Krum, Chicago, Ill. App. filed Aug. 18, 1916. Improved construction.

1,220,484. CENTRALLY CONTROLLED GENERAL-ALARM SYSTEM; Frank W. Wood, Brooklyn, N. Y. App. filed June 7, 1915. Enable all the control mechanism to be concentrated in a convenient place where instant attention can be given to it by the attendant or operator.

1,220,486. SELF-EXCITED DIRECT-CURRENT DYNAMO-ELECTRIC MACHINERY; Paul Amsler, Baden, Switzerland. App. filed Feb. 12, 1912. Relates to the stabilization of self-excited direct-current dynamo electric machinery.

1,220,493. FIRE ALARM AND MULTIPLE-CIRCUIT CLOSER; John A. Bunch, Adams, Ore. App. filed June 30, 1916. Provides

Record of Electrical Patents

Notes on United States Patents issued on March 25, 1917

an improved multiple contact circuit closer, comprising a stationary member and a movable member.

1,220,501. SOUND AMPLIFIER; William W. Dean, Rochester, N. Y. App. filed Aug. 28, 1915. Improvement.

1,220,508. ELECTRIC HEATER; Ralph R. Grimshaw and La Mar R. Jones, Findlay, Ohio. App. filed July 27, 1916. Installed on the engines of automobiles.

1,220,546. CONTROLLING MECHANISM FOR FLUID COMPRESSORS; Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. App. filed Feb. 7, 1914. Air-compressing pump operated by an electric motor.

1,220,569. SWITCH; Halfdan A. Steen, Milwaukee, Wis. App. filed Sept. 28, 1916. Embodying a blow-out magnet.

1,220,573. RHEOSTAT; Herbert A. Wallace, Pittsburgh, Pa. App. filed Nov. 27, 1916. Improvements.

1,220,587. ELECTRICAL MEASURING INSTRUMENT; Walter E. Beede, New York, N. Y. App. filed May 22, 1915. Adapted to give readings or current indications at opposite sides of zero point.

1,220,598. ELECTRIC WELDER; Edward A. Buckman, Walkerville, Ontario, Canada. App. filed Sept. 19, 1914. Combined butt and spot welding apparatus.

1,220,603. STORAGE-BATTERY CONSTRUCTION; David J. Cartwright, South Bethlehem, Pa. App. filed Jan. 15, 1912. Improved common terminal lug for the plates of a given polarity.

1,220,604. STORAGE-BATTERY PLATE; David J. Cartwright, Easton, Pa. App. filed Feb. 21, 1916. Provides a Planté plate of such proportions as to lessen the vertical growth in a plate of given capacity.

1,220,607. TESTING ARRANGEMENT; Henry P. Clausen, Mount Vernon, N. Y. App. filed July 24, 1916. For performing routine tests in telephone exchange systems.

1,220,608. ELECTRIC FITTING; John Cuthbert, Chicago, Ill. App. filed July 26, 1915. Improvements.

1,220,627. AUTOMOBILE-THIEF ALARM; William H. Hanssen, Denver, Col. App. filed Sept. 27, 1915. Circuit-forming means and signal-actuating means may be adjusted to any secret working combination to render either actuating means operative or inoperative.

1,220,634. PORTABLE ELECTRIC LIGHT; Conrad Hubert Hewlett, N. Y. App. filed May 29, 1915. Tubular flashlights having an electrically insulative shell or tube forming the principal part of the casing.

1,220,646. CIRCUIT CLOSER FOR FIRE ALARMS; Steven J. Kranyak, Duluth, Minn. App. filed Feb. 29, 1916. Provides a device consisting of a pair of contacts normally held out of engagement by a suitable material which will be easily melted after the degree of heat has increased beyond a predetermined point.

1,220,669. CUSP-DIAPHRAGM MECHANISM; Frank E. Miller, New York, N. Y. App. filed Sept. 16, 1916. Bears a close relationship to the organic mechanism of the human ear.

1,220,679. ELECTRICAL CONTACT; Charles Pfeiffer, Milwaukee, Wis. App. filed Nov. 19, 1913. Improvements.

1,220,701. CIRCUIT CLOSER FOR TRACK SWITCHES; Charles W. Squires, Beverly, Mass. App. filed Oct. 17, 1916. Mounted on the trolley wire.

1,220,715. PRIMARY TERMINAL; Charles W. Beck, Detroit, Mich. App. filed May 15, 1913. End of an insulated current-carrying cord may be fitted for quick and easy attachment to, or detachment from, a binding post or some similar terminal member.

1,220,721. AUTOMATIC RELEASE MECHANISM; Lynde Bradley and Harry L. Bradley, Milwaukee, Wis. App. filed Aug. 14, 1913. Adapted for use in controlling multiphase circuits in such a manner that an interruption of current in any one phase or line of conduction will automatically cause a complete interruption in all circuits.

1,220,756. QUADRUPLEX TELEGRAPHY; Isidor Kitsee, Philadelphia, Pa. App. filed Dec. 30, 1916. For instance as submarine cables.

1,220,763. REGULATING ARRANGEMENT FOR DYNAMO-ELECTRIC MACHINES; John Martin, Clifton, England. App. filed May 29, 1916. Improvements.

1,220,770. METHOD OF ELECTRICAL WELDING; Thomas E. Murray, New York, N. Y. App. filed Nov. 29, 1916. Method of electrically welding together two tubes, or pipes, relatively at right angles to one another.

1,220,774. METHOD OF ELECTRICAL WELDING; Thomas E. Murray, New York, N. Y. App. filed Jan. 10, 1917. Welded joint may be easily and quickly made in thin sheet metal.

1,220,776. METHOD OF ELECTRIC WELDING; Thomas E. Murray, New York, N. Y. App. filed Jan. 24, 1917. Electrical spot welds.

1,220,779. ELECTRICAL PLUG SWITCH; Edward J. Ovington, Newton Center, Mass. App. filed Nov. 29, 1913. Improvement.

1,220,780. ELECTRICAL CONNECTOR; Edward J. Ovington, Newton Center, Mass. App. filed Dec. 12, 1913. Improvement.

1,220,781. ELECTRIC HEATING DEVICE; Leon F. Parkhurst, Pittsfield, Mass. App. filed March 17, 1915. Unit is open at one side.

1,220,813. PROTECTIVE DEVICE FOR ELECTRIC DISTRIBUTING SYSTEMS; Charles J. Barrow, Los Angeles, Cal. App. filed Jan. 30, 1913. Diverts an abnormal current from the transformer by some suitable means so constructed that it will operate instantaneously upon the occurrence of the abnormal current and will be much more rapid in its operation than the circuit breaker.

1,220,826. RELAY; John T. Dempster, Schenectady, N. Y. App. filed June 24, 1916. Improvements.

1,220,833. MEASURING INSTRUMENT; Harry A. Ewen, London, England. App. filed Sept. 30, 1917. Instrument in which the effect of small extensions or contractions of a filament, or of external stresses applied to the filament, may be multiplied for the purpose of measuring the amount of the extension or contraction, or the strength of the applied stress, so as to give a measure thereof.

1,220,839. METHOD OF MAKING FURNACE HEARTHS; James H. Gray, New York, N. Y. App. filed Jan. 23, 1914. Material is introduced into place in a molten or semi-molten condition progressively and continuously from the bottom to the top.

1,220,842. COMBINATION ELECTRIC LOCK SWITCH; Robert O. Hammond, Paterson, N. J. App. filed Nov. 12, 1915. Provides a switch that will complete an electric circuit and at the same time produce a means whereby said circuit can only be completed by one familiar with the proper combination of the same.

1,220,848. ELECTRIC WELDING APPARATUS; Henry S. Holmes, Brooklyn, N. Y. App. filed Jan. 24, 1917. Device for interrupting the welding current after a predetermined amount of metal has been taken up at the welded joint.

1,220,886. TUNGSTEN CONTACT POINT; Carl A. Pfanstiehl, Waukegan, Ill. App. filed April 6, 1914. Improvements.

1,220,920. WIRELESS SOUNDER; Archie J. Williams, Covington, Ky. App. filed May 21, 1915. Sounder wherein the magnets are adjustable with relation to the diaphragms.

1,220,954. CIRCUIT CLOSER FOR DRIP-PAN ALARMS; James J. Chapman, Indianola, Miss. App. filed May 9, 1916. Improvements.

1,220,971. APPARATUS FOR CONTROLLING THE VOLTAGE IN VARIABLE-SPEED ILLUMINATING DYNAMOS; Ernest Fuchs, Billancourt, France. App. filed Aug. 31, 1915. Controller is provided which controls the field of the charging dynamo, so that a constant voltage is maintained.

1,220,981. INDICATOR; Joseph L. Gunge, Ann Arbor, Mich. App. filed Dec. 17, 1915. Indicates to the driver of a motor vehicle the direction in which a passenger is desirous of traveling.

1,220,993. PLUG AND SOCKET CONNECTOR; Joseph Sachs, Hartford, Conn. App. filed Feb. 26, 1917. Effective means for rapidly insuring a firm, substantial contact between the metal shell of the plug and the metal shell of the socket.

1,220,997. COMBINED SPOT AND BUTT WELDER; Elihu Thomson, Swampscott, Mass. App. filed Aug. 4, 1916. Machine combining in one structure electrodes for spot welding and clamps for butt welding, all fed from the same transformer secondary.